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And *The Nation's Health*

Volume 25 February, 1935 Number 2

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American Journal of Public Health
and THE NATION'S HEALTH

Volume 25 February, 1935 Number 2

Value of the Fluoroscope in Pulmonary Tuberculosis Case Finding*

HAYNES HAROLD FELLOWS, M.D.

Assistant Medical Director, Metropolitan Life Insurance Company, New York, N. Y.

IN the early part of 1927 we in the Medical Division at the Home Office of the Metropolitan Life Insurance Company were trying to find a solution to a tuberculosis problem which had been causing concern for a long time. Employees would occasionally report to the Dispensary complaining of typical symptoms of tuberculosis, although a satisfactory physical examination of the chest had been made a short time before. This happened in spite of the fact that our examining staff was made up of competent physicians, each one connected with hospital, clinic, or teaching institution, and some of them particularly trained in the diagnosis of diseases of the lungs. To complicate matters still more, we were seeing employees whose roentgenograms showed a lesion typical of pulmonary tuberculosis who had neither symptoms nor physical signs of pulmonary disease. With this evidence, we realized that even relatively large pulmonary lesions might not produce detectable signs or give any symptoms whatsoever. Incidentally, this was not as well known then as now.

We believed that for purposes of accurate diagnosis a routine X-ray examination of the chest would be ideal, but the technical problem of making the requisite 17,000 or more roentgenograms yearly was great and the question of expense was not ignored. Our problem was to find an accurate, rapid, economical way of selecting the proper cases for further X-ray study. It was decided to try fluoroscopy on a series of cases with the hope that this method of examination would fulfil the requirements. Consequently, in October, 1927, 100 individuals were examined physically, fluoroscopically and roentgenographically, and the results justified further trial.

In the first 7 months of this experiment 3,300 applicants for employment were examined, the examination consisting of the usual medical and personal history and physical and fluoroscopic examination. In this group we found 37 individuals whom we would have accepted after the physical examination, but who, after a fluoroscopic

* Read before the Child Hygiene Section of the American Public Health Association at the Sixty-third Annual Meeting in Pasadena, Calif., September 6, 1934.

examination, were classified as "abnormal chests," and then after X-ray examination were classified as having a lesion typical of pulmonary tuberculosis. We were convinced that we were on the right track and since that time have adhered to this method.

Our problem now divided itself naturally into two parts, the detection of pulmonary tuberculosis—(1) among applicants for employment and (2) among our Home Office employees.

From January, 1928, through December, 1933, 17,765 applicants for employment were examined, of whom about 95 per cent were girls and 5 per cent boys. The average age in this group was about 18 years. Among these applicants there were 244 persons whose roentgenograms showed a lesion typical of pulmonary tuberculosis (see Table I).

many of these applicants rejected because of chest lesions. We were able to follow closely 42 cases; the remaining 27 cases dropped from sight in spite of all efforts. The results were enlightening. Within the year we found by X-ray that 21, exactly one-half of the cases followed, had either a spread, or were complaining of symptoms denoting activity, or were developing abnormal physical signs, or already had been admitted to a sanatorium or hospital for treatment. Since starting this work we have been able to reëxamine and advise 75 per cent of the applicants rejected because of the presence of pulmonary tuberculosis, most of whom were in need of immediate treatment.

The findings among Home Office employees are given in Tables II and III. Table II shows the decreasing number

TABLE I

INCIDENCE OF PULMONARY TUBERCULOSIS AND METHOD OF DETECTION AMONG APPLICANTS FOR EMPLOYMENT
HOME OFFICE, METROPOLITAN LIFE INSURANCE COMPANY
1928–1933

Year	Number of Applicants	Cases of Pulmonary Tuberculosis and Method of Detection					
		Total		Suggestive History	Suggestive Physical Signs	Fluoroscopy Only	
		Number	Rate per 1,000 Applicants			Number	Per Cent of Total
1928-33	17,765	244	13.7	25	19	200	82
1928	4,405	69	15.7	9	7	53	77
1929	4,780	57	11.9	6	6	45	79
1930	3,105	36	11.6	3	1	32	89
1931	2,175	33	15.2	2	4	27	82
1932	2,134	32	15.0	2	0	30	94
1933	1,166	17	14.6	3	1	13	76

Because of the personal and public health aspects involved, we did not feel that our interest or responsibility ended with a refusal to employ these people. Consequently, we reëxamined, advised, and did all we could to help in the proper disposition of these cases. During the first year we also secured additional and subsequent information upon

of new cases of tuberculosis detected yearly. The decrease is due largely to the detection and classification in 1928 and 1929 of the healed cases among the older employees, and also to the fact that we are not now employing persons with demonstrable tuberculous lesions. Table III shows decrease by years in the number of cases needing treatment.

TABLE II

CASES OF PULMONARY TUBERCULOSIS (ACTIVE, ACTIVITY QUESTIONABLE, APPARENTLY HEALED) DETECTED AMONG EMPLOYEES OF THE HOME OFFICE, METROPOLITAN LIFE INSURANCE COMPANY
1928–1933

Year	Number of Employees	Cases of Tuberculosis Diagnosed	Rate per 1,000 Employees
1928	11,530	106	9.2
1929	11,966	85	7.1
1930	12,468	71	5.7
1931	13,081	72	5.5
1932	13,582	59	4.3
1933	13,960	42	3.0

TABLE III

CASES OF ACTIVE PULMONARY TUBERCULOSIS AND METHOD OF DETECTION AMONG EMPLOYEES OF THE HOME OFFICE, METROPOLITAN LIFE INSURANCE COMPANY
1929–1933

Year	Total		Suggestive History or Physical Signs	Fluoroscopy	Others (Routine X-ray Retake, etc.)
	Cases	Rate per 1,000 Employees			
1929	33	2.8	18	15	0
1930	29	2.3	17	12	0
1931	29	2.2	22	5	2
1932	33	2.4	20	8	5
1933	20	1.4	6	13	1

The results can be summarized by saying that we believe that we are not now employing persons with pulmonary tuberculosis and we are everlastingly alert to detect this disease in our Home Office employees at the earliest stage.

And, curiously, our endeavors have brought us face to face with another phase of the problem which is now causing some perplexity. For years we have been encountering individuals whose chest roentgenograms show evidence of a typical tuberculous lesion, who are asymptomatic and demonstrate no abnormal physical signs. Among the company employees we have advised and urged the younger ones and those whose lesions are shown to be unstable by X-ray examination to take treatment at the company sanatorium at Mount McGregor, and have allowed the others to work under very close observation. So far, we believe we have made no mistake. An analysis of 141 cases diagnosed as tuberculous subsequent to a negative X-ray or negative fluoroscopic examination shows that significant pulmonary tuberculosis may develop in the late adolescent and adult, that it is possible to detect many of these cases at a stage before physical signs or symptoms can be elicited, that some of these cases follow an unsatisfactory course while others are cured without untoward incident at our sanatorium. It is not possible to foretell which case will react favorably and which unfavorably, so we believe that the safest method is to advise the younger members of such a group to take sanatorium

treatment under favorable circumstances, and to keep the older individuals under close medical observation.

After 7 years' experience with our present routine of chest examination, we believe that we have made real progress in handling our pulmonary tuberculosis problem. Realizing that a physical examination, no matter how painstakingly done, does not reveal abnormal signs in a large number of tuberculous cases, we have met this shortcoming by adding a routine fluoroscopic examination and a roentgenographic examination of cases selected by this method for further study. From the administrative standpoint, this method is rapid and economical; as checked by X-ray examination, it is accurate.

Our Front Window

WHILE we watched a drug clerk meticulously attach a label to a prescription the other day, we wondered how long this business of labeling merchandise had been going on. So we found out. At the Ever Ready Label Corporation in New York they know a lot of curious things about labels. One of them is that cattle were probbably the first articles of commerce to be labeled—by brands, too!

Wooden labels for mummy cases came along about 1000 B.C. From the same period, on a bamboo container, this inscription has survived: "This is for swellings."

Of course we could go back further than that, if we wanted to. We now know about King Pepy I who flourished in 2750 B.C., and the big clay tablets of his reign which announced the ownership of various articles. And the papyri of ancient Egypt carried tables of contents, and in 2698 B.C. Chinese potters were branding their wares in color.

One of those which interested us most—it is now at the Metropolitan Art Museum—said: "If you like my painting you may find me at the Bridge of Man-Chu." And then, too, we could talk for several minutes about Assyria and the heart-shaped stone tag with a hole through it. This bore the inscription: "Sheep belonging to the Shepherd Ludmahum."

Misbranding, we regret to report, arose with the increasing popularity of labels and in the Middle Ages an Elector of the Palatinate found it necessary to publish a warning that any innkeeper who sold ordinary wine labeled as Rudesheimer would be hanged.—*Am. Druggist*, Jan., 1935, pp. 14–16.

A Diphtheria Immunization Campaign in Austria*

GEORG PÖCH AND CHARLES N. LEACH

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DURING the past 4 years Austria has suffered an unusually high incidence of diphtheria, but the case fatality rate has been extremely low. The province of Burgenland, which forms the eastern boundary of the Republic, has been particularly affected, as hospitals are few and far between, and the cost of antitoxin is in many cases prohibitive.†

In 1925 diphtheria preventive measures received a definite setback in Austria following 6 fatal accidents in Baden bei Wien.[1] The use of toxin-antitoxin was prohibited by government decree. In 1932, by authorization of the Austrian Superior Medical Council, the Bezirk Eisenstadt,‡ in the Province of Burgenland, where diphtheria was prevalent, and where no immunizations had been done, was set aside as a field where the newer methods of prophylaxis could be investigated. The primary object was to study the epidemiology of diphtheria and to demonstrate the harmlessness of formol-toxoid injections and their protective value.

The Bezirk Eisenstadt has a well organized health unit under the direction of a full-time health officer, and has served as a demonstration health unit since 1929. The staff of physicians and nurses is so organized as to facilitate follow-up work. As will be seen from Figure I, the diphtheria morbidity rate in the bezirk in 1932 was extremely high, 764 per 100,000 inhabitants. The case fatality was low, about 2.5 per cent, and there were very few severe cases. Austria as a whole shows a similar picture, with a considerable increase in the morbidity rate from 1930 to 1932, the highest since 1894.

The Burgenlanders are primarily agricultural, but their dwellings are almost entirely in closed villages. In these communities the housing conditions are in many instances as unhygienic as those in the most densely populated sections of Vienna; there is much overcrowding, and extreme poverty. The population of the Bezirk Eisenstadt according to the 1923 census was 42,010, concentrated almost entirely in 29 compact villages.

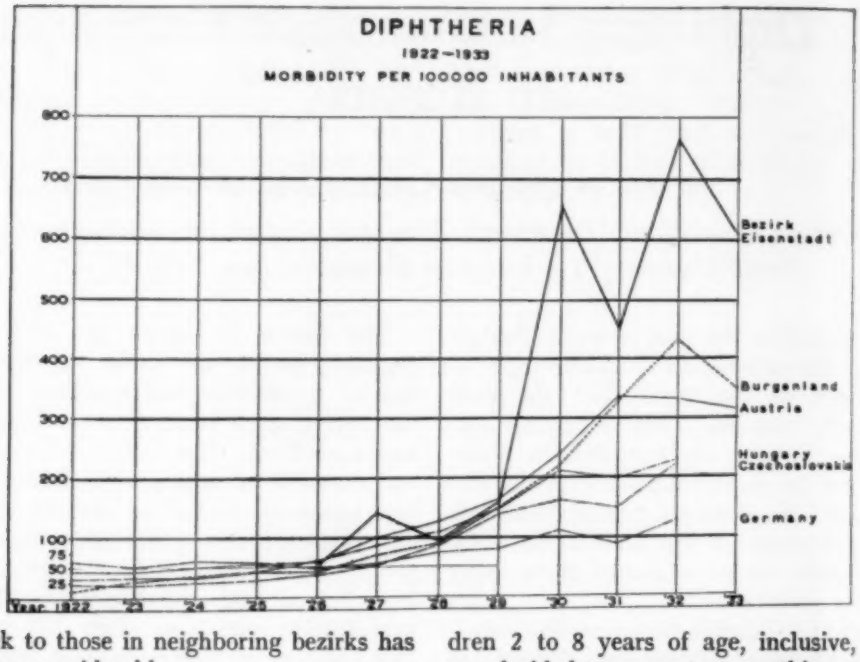
The high prevalence of diphtheria, with the disease occurring first in one village and then in another, has put a heavy financial burden on the communal governments and sickness insurance companies. There are no communicable disease hospitals in the district, and the cost of transporting the

* The studies and observations herein reported were conducted with the support and under the auspices of the International Health Division of The Rockefeller Foundation. This investigation was made possible through the consent and approval of the Volksgesundheitsamt of the Austrian Ministry of Social Welfare.

† Antitoxin retails at Sch. 3.80 ($.70) per 1,000 unit lots. In quantities of 10,000 units it costs Sch. 35.00 ($6.48).

‡ The bezirk corresponds to the American county.

FIGURE I—Comparison of the diphtheria morbidity rate for the Bezirk Eisenstadt with the rate for the Province of Burgenland and rates for Austria, Hungary, Czechoslovakia, and Germany, during the period 1922–1933



sick to those in neighboring bezirks has been considerable.

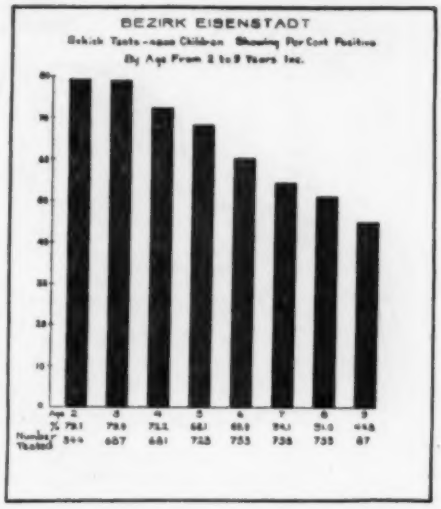
Since 70 per cent of all cases of diphtheria were being reported among children 2 to 8 years of age, inclusive, it was decided to concentrate on this group with our program of immunization. The following plan was adopted:

FIGURE II—Bezirk Eisenstadt

1. Perform Schick tests on, and take nose and throat cultures from, as many children as possible in the age group 2 to 8 years inclusive.
2. Read Schick tests 4 days later and administer 0.5 c.c. of formol-toxoid (8 fl. units) to each alternate Schick positive child, the remaining Schick positive children to be left as a control group.
3. Administer 1.0 c.c. of formol-toxoid 11 to 14 days after the first injection.
4. Administer 1.5 c.c. of formol-toxoid 11 to 14 days after the second injection.
5. Make virulence tests on all diphtheria cultures obtained from carriers.
6. Perform second Schick tests on as many immunized children as possible.
7. Take blood samples (5.0 c.c.) from a certain number of children in each village at the time of the second Schick test, and titrate the serum for antitoxin content as a parallel to the Schick test.

A card index was prepared including every child in the bezirk between 2 and 8 years of age, of whom there were 5,173. Of this number 4,879 appeared for the preliminary examination. Later, 4,809 were present for the Schick reading, of whom 3,096 were found to be positive. Of the Schick positives 1,746, or 56.4 per cent, were given 3 injections (3 c.c. total) of formol-toxoid. Of 2,006 children who received the first injection 1,746, or 87.0 per cent, completed the series. This high percentage was made possible through the excellent collaboration of the population and the local health authorities. The percentage of children receiving 3 injections is generally much lower, and the efficiency of the 3 injection method is thus being markedly diminished. The campaign was inaugurated in May, 1933, and ended in August of the same year.

FIGURE III—Percentage of Schick positive children, by ages, among a total of 4,809 tested



The toxin used for the Schick test is a product of the State Serum Institute in Vienna and complies with the international standard.[2] The immunizing material was formol-toxoid (8 fl. units), produced by the State Serum Institute and was supplied gratis. The formol-toxoid was injected subcutaneously over

TABLE I

REACTIONS TO FORMOL-TOXOID INJECTIONS

	Redness		*Redness Induration Slight Fever*		*Redness Induration Fever*	
Age	*Number*	*Per Cent*	*Number*	*Per Cent*	*Number*	*Per Cent*
2	3	2.0	0	0	0	0
3	5	1.6	0	0	1	0.3
4	7	2.2	3	0.9	0	0
5	9	2.8	3	0.9	1	0.3
6	14	4.9	7	2.4	0	0
7	8	3.2	4	1.6	0	0
8	15	6.3	7	3.0	0	0
Total	61		24		2	

FIGURE IV—Incidence of diphtheria in the Bezirk Eisenstadt during the period from the beginning of the campaign, in May, 1933, to December 31, 1933

Diphtheria In Schick Negative
In Schick Positives - Controls
In Schick Positives Immunized
Received Less Than 3 Injections
Deaths
Cases Occuring Before Investigation Began, Or Not In Age Group Shown Outside Of Circles
BEZIRK EISENSTADT
DIPHTHERIA INVESTIGATION
1933
Entire Bezirk Children 2 to 8 Years Of Age Inc.
Circle Represents Child Group Under Investigation
Per Cent Schick Positive
Per Cent Immunized
Per Cent Schick Negative

the left deltoid in 0.5 c.c., 1.0 c.c., and 1.5 c.c. amounts at intervals of 11 to 14 days. All Schick tests and readings were made by 2 young physicians who had received special preliminary training in the work at the University Kinderklinik in Vienna. No severe reactions occurred. Table I shows the frequency and severity of reactions among the group immunized.

Of the group of 1,746 children receiving 3 injections 4.6 per cent showed reactions according to the foregoing classification. The age distribution is given below.

Reactions by Ages

Age	*Number*	*Per Cent*
2	3	2.0
3	6	1.9
4	10	3.1
5	13	4.0
6	21	7.3
7	12	4.8
8	22	9.3

TABLE TO FIGURE IV

TOWNSHIP	Number of Children Tested	Per Cent	
		Schick Positive	Immunized
I Eisenstadt	418	73.7	52.2
II Rust	195	64.1	31.8
III Purbach	269	52.8	27.1
IV Hornstein	275	62.2	28.0
V Neufeld	240	81.3	60.0
VI Siegendorf	262	72.5	45.8
VII St. Margarethen	274	72.3	40.1
VIII Mörbisch	289	40.1	18.3
IX St. Georgen	122	43.4	19.7
X Zagersdorf	161	50.3	31.1
XI Trauersdorf	187	48.7	32.1
XII W. Prodersdorf	244	68.9	37.7
XIII Zillingtal	117	50.4	18.8
XIV Stinkenbrunn	169	57.4	27.8
XV Müllendorf	100	76.0	32.0
XVI Klingenbach	166	44.0	27.7
XVII Gross Höflein	179	70.4	31.3
XVIII Klein Höflein	95	86.3	36.8
XIX Oslip	120	75.9	45.8
XX Oggau	211	70.6	32.2
XXI Schützen	140	69.3	27.9
XXII Donnerskirchen	179	74.3	56.4
XXIII Wimpassing	98	72.4	44.3
XXIV Leithaprodersdorf	131	65.6	44.3
XXV Breitenbrunn	168	64.5	33.3
Total	4809	64.3	37.0

Second Schick tests were done on 596 children in 8 villages from 10 weeks to 7 months after the third injection of

formol-toxoid. Of these, 44, or 12.6 per cent, remained Schick positive, and 552, or 87.4 per cent, were Schick negative after 3 injections.

Blood samples were taken from 213 children at the time of the second Schick test. The results of antitoxin titration as compared with Schick results will be reported later.

Complete results from the carrier survey are as yet not available. Of the 9,237 nose and throat smears examined, 124 gave positive results; and of these, 21 proved to be virulent on animal tests.

In each village every practising physician was furnished with a list of children in his community, showing results of Schick tests, those immunized, and results of second Schick tests on the latter. This served to stimulate their interest and assisted greatly in the reporting and follow-up of new cases.

TABLE TO FIGURE V

Township	Number of Children Tested	Per Cent	
		Schick Positive	Immunized
1 Eisenstadt	418	73.7	52.2
2 Rust	195	64.1	31.8
3 Purbach	269	52.8	27.1
4 Hornstein	275	62.2	28.0
5 Neufeld	240	81.3	60.0
6 Siegendorf	262	72.5	45.8
7 St. Margarethen	274	72.3	40.1
8 Mörbisch	289	40.1	18.3
9 St. Georgen	122	43.4	19.7
10 Zagersdorf	161	50.3	31.1
11 Trauersdorf	187	48.7	32.1
12 W. Prodersdorf	244	68.9	37.7
13 Zillingtal	117	50.4	18.8
14 Stinkenbrunn	169	57.4	27.8
15 Müllendorf	100	76.0	32.0
16 Kleingenbach	166	44.0	27.7
17 Gross Höflein	179	70.4	31.3
18 Klein Höflein	95	86.3	36.8
19 Oslip	120	75.9	45.8
20 Oggau	211	70.6	32.2
21 Schützen	140	69.3	27.9
22 Donnerskirchen	179	74.3	56.4
23 Wimpassing	98	72.4	44.3
24 Leithaprodersdorf	131	65.6	44.3
25 Breitenbrunn	168	64.5	33.3
Total	4809	64.3	37.0

FIGURE V—Incidence of diphtheria in the Bezirk Eisenstadt from January 1 to May 1, 1934

TABLE II

INTERVAL BETWEEN THIRD INJECTION OF FORMOL-TOXOID AND ONSET OF DIPHTHERIA IN 29 CHILDREN

Case Number	*Interval*	*Case Number*	*Interval*
6	21 days	101	5 months
12	29 "	112	5 "
23	42 "	138	5 " 12 days
37	2 months, 25 days	169	5 " 29 "
107	3 "	134	6 " 25 "
97	3 " 6 "	188	6 "
39	3 " 15 "	146	7 "
133	3 " 28 "	150	7 "
52	4 "	177	7 "
116	4 " 2 "	181	7 " 5 days
92	4 " 5 "	182	7 " 5 "
56	4 " 6 "	183	7 " 18 "
96	4 " 7 "	192	9 " 8 "
137	4 " 8 "	194	9 " 22 "
67	4 " 10 "		

It is approximately a year since the campaign was inaugurated, and it is interesting to note the results of immunization with a formol-toxoid of low antigenic value after this length of time. Diphtheria has continued to be very prevalent. The spot maps show the occurrence of the disease, Figure IV from the beginning of the campaign in May, 1933, to the end of the year, and Figure V from January 1 to May 1, 1934.

The village of Rust (see Figure II), population 1,361, presents a particularly interesting situation. During the past 12 months 97 cases of diphtheria have occurred, of which 12, or 19.4 per cent, were in the group having 3 injections of formol-toxoid (3 c.c. total). Of the total immunized in the entire district, 29, or 1.66 per cent, contracted the disease. It is evident that, in the face of a severe epidemic, and in spite of the fact that 92.6 per cent of the children were rendered Schick negative by the 3 injections of formol-toxoid, the antigen used offered an inadequate means of protection. While 29 cases occurred among the "immunized" children, there were only 37 in the control group. All cases of diphtheria occurring among the children who had received the 3 injections of antigen were very mild, while among the unimmunized children, 11 deaths were recorded, of which 4 were in the control group.

SUMMARY AND CONCLUSIONS

In a rural county of eastern Austria, with an unusually high incidence of diphtheria, 1,746 children 2 to 8 years of age inclusive, out of a total of 3,096 Schick positives, were given 3 injections of formol-toxoid (8 fl. units). During the year following the inauguration of the campaign, 29 cases of diphtheria occurred among those, and 4 among children giving a Schick negative reaction.

The antigen employed was apparently of too low potency to protect against diphtheria when used in the presence of an epidemic of unusual intensity. The severity of the disease was modified in those who had received 3 injections (3 c.c. total) of antigen.

REFERENCES

1. Grassberger, R. *Arch. f. Hyg.*, XCVII:97, 1926, and *Lancet*, II:1,074, 1926.

2. *Report of the Permanent Commission on Biological Standardization: Series of League of Nations Publications, III. Health*, III, 10, 1931.

Experiences With Sewage Farming in Southwest United States

Texas

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CERTAINLY no more appropriate time than the present could be selected for discussing the conservation of water for irrigation, even water from sewage disposal plants, when in many sections of the country crops are suffering from drought. However, in some sections of Texas, droughts are of more or less intermittent occurrence, and part of the state is normally arid; hence, the question of placing sewage effluents on land for crop irrigation has long been of interest to Texas engineers who were searching for an economical method of disposing of a city's liquid wastes. One town has been employing land disposal for more than 20 years, another for 9 years, while still others have used the process for 7, 6, 4, and 2 years with fair results.

The disposal of sewage on land has come about gradually and naturally as streams became foul during minimum flow periods and land disposal was found to be feasible and economical. There are now 68 towns in Texas using land disposal as a secondary means of sewage disposal, and of these, 34 grow crops, and 2 use sub-surface irrigation. The chief concern of the sewage engineer has been to dispose of the effluent so as to cause no nuisance, and the value of the waste water as an irrigant has later become apparent. There is a tendency at this time to give more consideration to this means of sewage disposal, as much from a desire to provide water for crop irrigation as to keep waste water out of streams. The two-fold value of the method adds interest to the problem but also makes the method of disposal more complicated and difficult of successful operation.

A résumé of the data collected by a recent survey of Texas cities reveals some interesting facts concerning this method of sewage treatment or disposal.

Some cities purchase their land, paying from $25 to $125 per acre, and operate the farm; others lease the city owned land to farmers who get the revenue for taking care of the sewage effluent, while still others donate the water to a farmer for his own land, supplying the effluent as the farmer needs it.

The crops most successfully grown on these sewage farms are the small grains, as maize, hegira, kaffir, and corn; the grasses, as sudan, rescue, Johnson grass, and cane; although other crops as cotton and alfalfa have been grown with profit. In addition, orchards of pecan, walnut, grape fruit, and oranges are

* Read at a Joint Session of the California Sewage Works Association and the Public Health Engineering Section of the American Public Health Association at the Sixty-third Annual Meeting in Pasadena, Calif., September 6, 1934.

profiting by sewage irrigation in some sections. Small truck crops irrigated with sewage have included beans, pumpkins, potatoes, peas, and asparagus; while a few cities dispose of their excess activated sludge in the growing of roses, tulips, and other flowers.

The number of acres used by towns ranges from 1 to 3,500, while the total number of acres at present being irrigated for crops in Texas is approximately 4,500. The town using only 1 acre of land employs sub-irrigation. The City of San Antonio has for 20 years discharged its sewage effluent into Lake Mitchell, a holding reservoir, thence to approximately 3,500 acres of land which is cultivated. The average city sewage farm, however, is about 20 acres.

The cost to cities of irrigating varies from nothing, where the effluent is donated to a farmer, to $10 per m.g., assuming no returns on the crops. In many instances the value of the crops has more than paid for the expense of keeping the farm in good condition. Cities operating their own farms have shown a revenue per acre per year of $25 to $135.

The minimum number of gallons of effluent applied per acre per day is shown to be 4,500, the maximum, 150,000 gal., but in the latter case the soil is sandy, regularly loosened, has good sub-drainage, and the effluent is applied only at weekly intervals. This virtually means a minimum application of 4,500 gal. per acre per day and a maximum of 25,000 gal.

All towns employing land disposal give the sewage some preliminary treatment, usually sedimentation in plain or Imhoff tanks, while several apply filtered effluents although this secondary treatment is not necessary for successful operation. It so happens that a few towns installed filters and later decided to dispose of the effluent on land. About 20 towns use land disposal constantly, while some 48 depend on land disposal only intermittently, as during low stages in the receiving stream or as irrigation water is needed by the coöperating farmer or farm manager.

Land disposal of sewage effluents depends for its successful use upon local conditions such as type of soil, the amount of effluent available, cost of land, climate, and other factors.

While the majority of the towns employing this process satisfactorily are located in the arid western part of the state, a few in the southern and eastern portions have used it also with success. Two towns reported the soil too heavy in that particular locality, while one found the salt content of the effluent so high as to impair the soil for successful cropping. Four industrial institutions have found land irrigation a successful method of disposing of wastes from packing houses, cheese factories, and milk plants. The average rate of application for industrial wastes has been found to vary from 5,000 gal. per acre per day up to as high as 15,000 gal., where ideal conditions have been present. Where the land has not been overdosed, no nuisances have been reported.

As a guide to our Texas municipalities and designing engineers interested in land disposal of sewage, we have made the following suggestions:

1. Irrigation, with sewage effluents, of vegetables eaten raw will not be permitted at this time.

2. All sewage effluents disposed of on land should have pre-treatment by sedimentation, or other method, to reduce settleable solids by at least 50 per cent.

3. The use of an earthen holding tank or reservoir facilitates application of the liquor but its use is advisable only when located far enough from occupied homes to prevent odor annoyance and where proper maintenance to prevent fly and mosquito breeding nuisances is assured.

4. Adjustment of chemical treatment to avoid injury to soil bacteria and removal of

all oils and greases is necessary. Acids and alkalis in the effluent are likely to ruin the fertility of the soil.

5. Care must be exercised in applying a sewage effluent to growing crops, in order to prevent ponding and water-logging of the land. The furrow irrigation is found to be more practical than the border method.

6. Sludge disposal can be successfully effected in some instances by means similar to those employed in broad irrigation.

7. Acreage required for broad irrigation will depend primarily on the soil, both top and sub-soil which must of necessity be porous, as sand, sandy loams, etc. A study of the absorptive capacities is requisite to determination of area required.

8. A study of the water requirements of all possible crops is under way. The amount of sewage conducive to the growth of one crop may be an "over dose" to another. If utilization of the effluent for crop irrigation is not anticipated, the study will of course be confined to natural existing vegetation.

9. With few exceptions sewage should not be applied to the fields in quantities greater than that absorbed within a period of 30 minutes. Rotation and intervals of application will vary with absorptive characteristics of the soil and the frequency of plowing. Deep plowing (12") at intervals of 6 to 12 months is recommended. Frequency of shallow plowing will be determined by surface conditions and should be practised to the extent that top soil will dry out thoroughly. Ponding should be prevented at all times to eliminate potential nuisances.

10. If crops are to be planted, reserve acreage must be provided upon which effluent can be placed during rainy weather and when crops do not require additional moisture.

11. Rainfall, evaporation, and temperature are to be taken into consideration in determining the acreage requirements for land disposal.

Cancer

CANCER research is taking a new tack, according to Dr. William J. Mayo of the famous Mayo Clinic at Rochester, Minn. This he described as an individualistic study of cancer as it occurs in different types of people according to various conditions, sexes and social customs and chronic irritation previously.

In comparison with other diseases cancer was studied and attacked as a problem of mass disease. Now, however, search is directed at ascertaining why certain people are susceptible to cancer while a far greater number are immune to it under the same conditions.—*Am. Druggist*, Jan., 1935, p. 4.

Experiences With Sewage Farming in Southwest United States*

Arizona

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IN endeavoring to present to you the sewage farming situation in Arizona, there are many items which have to be omitted due to a lack of reliable information; but with the information available, the subject will be presented as thoroughly as time permits.

When first considering this subject, the city of Tucson was studied from every angle, then by incorporating some material from the city of Casa Grande, a more complete picture is obtained of the sewage farming situation in the southern part of the State of Arizona.

This portion of the United States is most arid; this climatic feature has a tremendous influence on farming conditions.

In presenting the picture of sewage farming the cities of Tucson and Casa Grande will be generally considered from the viewpoints of operation, economics, and public health.

SEWAGE FARMING IN TUCSON

In considering this situation it is necessary to give the following pertinent facts about this city:

Population according to the 1930 census	32,506
Average yearly precipitation	11.5"
Average temperature per year	66.0° F.
Average minimum temperature	49.9° F.
Lowest recorded temperature	12.0° F.
Average maximum temperature	82.0° F.
Highest recorded temperature	112° F.
Average sewage flow	2.5 m.g.d.
Average type of sewage is domestic, with small creamery waste	
Average water consumption (1922–1933 inclusive)	4.9 m.g.d.

The city has a separate sanitary sewerage system that concentrates at the northwest corner of the city. From here the sewage flows by gravity through a 30" concrete outfall line to an inverted siphon some 3.1 miles from the city. After passing through the siphon under the river, the sewage flows through a screening chamber, then into a sedimentation chamber, with a 30–45 minute retention period, then out onto the farm. The sludge from the sedimentation chambers is concentrated and automatically pumped into a battery of 5 uncovered sludge digestors, the overflow from the digestors running back into the sedimentation chambers.

The raw sewage as it reaches the screening chamber has a hydrogen sulphide content at times of approximately 6 p.p.m., which is not surprising in view of the fact that the inverted siphon has to be cleaned from time to time due to accumulations of solids. There are places of seeding along the outfall line that produce a septic influent to

* Read at a Joint Session of the California Sewage Works Association and the Public Health Engineering Section of the American Public Health Association at the Sixty-third Annual Meeting in Pasadena, Calif., September 6, 1934.

the plant. The nature of the plant with purely primary sedimentation does not improve the quality of the effluent, except to reduce the suspended and settleable solids in the amount of 79 and 95 per cent, respectively. The suspended solids average about 300 p.p.m. in the raw sewage.

The effluent as it discharges onto the farm, is therefore in a septic condition, and odors arising from the farm should not be charged to the farm, nor in the main to the uncovered condition of the digestors at the plant, but rather to the poor condition of the influent.

In the operation of the farm, there are objectionable odor conditions that arise from time to time, although recently there have been few objections by neighbors. These odor conditions may be kept to a minimum if the following precautions are observed in tilling the soil:

1. Pooling or standing of sewage in the furrows should be completely eliminated, either by plowing, cultivating, or other process.
2. Banks of ditches should not be allowed to become rank with growth so as to catch and retain the solids along the borders. This may be controlled by the use of chemicals, or by keeping the banks constantly spaded.
3. Cross-sections of irrigation ditches should be small with a maximum of depth and a minimum of width.
4. Choice of soil is an important item. A sandy loam is to be preferred to other type to preclude possibility of the soil "sealing itself off."
5. The city should operate the farm itself or have administrative power over the management to preclude the possibility of nuisance.

The city of Tucson has protected itself from odor complaints by the purchase of large tracts of land. At the present time the area of the farm comprises 1,360 acres of which they use 200 in summer to dispose of the 2½ m.g.d., or 12,500 gal. per acre per day in the hot summer months with the high evaporation available; and 350 acres in winter to dispose of the same amount of sewage, or 7,800 gal. per acre in the winter months.

It takes approximately 5 men, including the superintendent, to operate this farm and disposal plant adequately.

The crops that are grown in this particular climate with the yield per acre as accurately as the available information presents are:

1. Barley for hay and grain, 1 ton of threshed grain and 1½ tons of hay per acre per crop
2. Corn for use as ensilage, 8½ tons of ensilage per acre
3. Alfalfa for use as hay, 1 ton per acre per cutting, and 5 cuttings per year
4. Maize either as milo-maize, higuera, or federita, all used as fodder crops, 1 ton per acre
5. Sudan grass used for grazing (this practice has been discontinued)
6. Cotton, 1 bale per acre

According to a former farm superintendent, a yield of 25 to 30 per cent greater from sewage irrigated land would be expected than from other irrigated land in that particular locality. Due to the fact that this farm has not been completely leveled, the yield is approximately the same as that from adjacent farms.

A few of the economic features are presented below:

CAPITAL INVESTMENTS

Cost of the 1,360 acres for the farm	$64,350
Cost of the disposal plant and accessories	82,600
Cost of various improvements to the farm itself	30,000
Total cost of the system up to the present	$176,950

Operational costs include all outlay, subtracting all income:

1927–1928	$7,655.74
1928–1929	9,041.18
1929–1930	16,468.56
1930–1931	22,744.14
1931–1932	8,852.89
1932–1933	4,324.59
1933–1934	3,327.73

The years of high operational cost

were those in which ambitious programs were carried out. It has been discovered that if the farm is operated only as a means for disposing of the sewage, without attempting to produce record crops, or incidentally to compete with other farms, greater economy is effected. Crops raised are but incidental items, revenue from crops helping to offset operation expense. In addition, if this policy is carried out it does not place the city in the embarrassing position of trying to compete with private enterprise.

The public health aspects are roughly presented in the following sub-divisions:

1. Harvesting and pen-feeding, seemingly present little danger. The crops that are at present grown on this land are harvested so that they are exposed to a minimum of contamination. The hay that is cut is on a dry field. With the amount of curing and exposure to the elements it seems hardly possible that disease could arise from this source.

2. If cattle are grazed, an entirely different condition arises. To illustrate this point an example of a recent condition is submitted:

A herd of 45 cattle fattened on this farm were slaughtered and 23 were found to be infested with tapeworm (*Cysticercus bovis*), the larval stage of the tapeworm *Taenia saginata*. The cattle all bore different brands and were assumed therefore to have come from different ranges. Due to this fact, and also that this particular herd of cattle persisted in drinking effluent from the plant in preference to fresh water, it has been concluded that they were infestated from this common origin.

With the exception of the draft animals grazed on this land and used by the city, it has been recommended that the practice of raising live stock on this farm be discontinued.

3. The danger from fly-borne disease is great from a farm of this kind if the farm is not properly worked. The personnel must watch for and eliminate all places of fly breeding.

4. The danger of use of this type of broad irrigation to underground water supplies has not been thoroughly investigated, although no signs of pollution have been discovered. If the region were more populous, this might be a serious problem, but as the shallow ground water table is at a depth of at least 30′, and domestic wells are located a considerable distance from the main body of the farm, it is not as important as it might be elsewhere.

SEWAGE FARMING IN CASA GRANDE

The city of Casa Grande will be compared from some viewpoints with Tucson.

The statistics necessary to obtain a picture of this community are:

Population according to the 1930 census	1,351
Average yearly precipitation	6.89″
Average yearly temperature	71.7° F.
Average minimum temperature	51.7° F.
Lowest recorded temperature	13.0° F.
Average maximum temperature	87.6° F.
Highest recorded temperature	122° F.
Average sewage flow per day	150,000 gal.
Type of sewage—domestic with small creamery wastes	
Average gross water consumption per day (1933)	238,000 gal.

There is a separate sewerage system that concentrates at the northwest corner of the city, where the sewage is treated with chlorine gas, and after treatment flows 6,300′ northwest to the outfall, which is a 12″ vitrified clay tile pipe.

At the point of outfall the sewage was at one time introduced into a septic tank, but due to the trouble caused by irrigation with septic sewage this was discontinued. For the past 3 years the raw sewage has been taken from the outfall and used for irrigation.

The chlorination of the sewage has been experimented with to the point that they may control odors at the

sewer farm if they dose at the rate of 6–7 p.p.m., although residual chlorine is not carried in the sewage to a manhole 300′ away from the point of chlorination. If the dosage of chlorine is increased to 10–11 p.p.m. the residual chlorine will be carried to the point of outfall.

In farming only 25 acres are required to dispose of the sewage, or 6,000 gal. per acre. The city owns 40 acres of this sandy loam, but have not been obliged to use more than the 25. The small acreage required is due principally to the control of odors through chlorination.

The only crop raised is cotton. The yield is usually 2 bales per acre, as compared to 1 bale per acre on the best adjacent farms.

The city does not farm this land itself, but leases it at a rate of $90 for 3 years. The cost of chlorination is $.50 per day, or $183 per year, dosing at the rate of 6–7 p.p.m. Therefore, the cost to the city is $153 per year plus supervision to dispose of the 150,000 gal. per day flow.

It takes but 1 man, furnished by the lessee, to take care of this amount of sewage on this 25 acre tract. The provision made in the city's contract is that only those crops approved by the city government will be grown. The city therefore has an administrative power over the land.

CONCLUSION

In conclusion, it would seem that a combination of these two methods of sewage farming would be satisfactory in this climate providing that industrial wastes do not complicate the problem. With the ordinary domestic wastes, the system of prechlorination with a long contact period, to aid in sterilization and to enable the sewage to reach the land in a fresh condition, coupled with screening and primary sedimentation to relieve the land of some of the load placed on it, would prove economical and satisfactory from every viewpoint, in the system of sewage farming as developed by these two cities.

NOTE: Appreciation is extended to the following individuals in their coöperation and efforts in discovering information on this subject:

George W. Marx, Sanitary Engineer, City of Tucson

R. C. Butler, City Manager, City of Tucson

C. E. Pecquignot, Auditor, City of Tucson

M. E. Watson, Farm Superintendent, 1930–1932, City of Tucson

Mr. Norman, City Engineer, City of Casa Grande

Tribute to Bailey K. Ashford

FROM Puerto Rico comes word of an affectionate tribute paid to the memory of Dr. Bailey K. Ashford, whose autobiography, *A Soldier in Science*, was published recently by Morrow.

In the hall of the School of Tropical Medicine, at San Juan, stands the bust of Dr. Ashford. Since his death a few weeks ago the early morning arrivals at the school have found the statue banked with flowers, many in strange little native jars. A watchman was appointed to see who the donors were. In the middle of the night several Puerto Rican women, dressed in shabby black and heavily veiled, stole in, their arms filled with flowers. It was evident that they were poor people who had walked many miles from the heart of the hills to pay a last tribute to the doctor who had saved them or their children from the scourge of hookworm. —*N.Y. Times Book Rev.*, Dec. 30, 1934.

Experience With Sewage Farming in Southwest United States*

California

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IRRIGATION of crops with sewage has been practised in California for many years. Pasadena's sewer farm was purchased in 1887 and is probably the oldest in the state.

Early methods of handling sewage were crude. Few treatment plants were in use and there was little or no restriction on crops raised. The tendency then, as now, was to derive the greatest possible revenue from the farm, and regard for sewage disposal was secondary. It naturally followed that dissatisfaction arose; neighbors complained of odors; flooding of adjoining property; and fly and mosquito breeding. In 1900 to 1910, many septic tanks were constructed, hoping to overcome the objections; but experience with them was disappointing. Imhoff tanks came on shortly after and gave some improvement. In recent years, both Imhoff tanks and separate sludge digestion plants have been used for preliminary treatment and the trend has been to adopt trickling filters and activated sludge plants for oxidation works, prior to irrigation.

There was a steady increase in use of sewage for irrigation during the 30 year period from 1890 to 1920. The peak was reached about 1923 when some 70 municipalities disposed of all or part of their sewage by irrigation of crops. Accurate data are not available for the period before 1920, but since that year, 15 places have started irrigation with sewage and 30 others have abandoned the practice. Those abandoning sewage farming have, in the majority of cases, gone into joint outfall sewers, spread the sewage on land without cropping, or constructed new disposal works. At the present time, sewage from 53 municipalities is being disposed of by irrigation of cultivated crops, from 9 others by irrigation of wild crops, and from another 28 on land with no crops.

Thus 90 out of a total of 310 municipalities in California having sewer systems, now have land disposal.

A survey of use of sewage for irrigation in California was made by the Bureau of Sanitary Engineering in 1933. At that time 62 cities reported use of sewage on land, and 46 went in for some kind of cropping, watering a total of 4,050 acres. Of this, 3,628 acres were under cultivation, the remainder being wild grass. The acreage of various crops irrigated with sewage effluent included 340 acres of vegetables (all of

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varieties that are eaten cooked); 150 acres of dry beans, 63 acres of tomatoes, and 1,660 acres of fruit trees and vineyard. The remaining 1,617 acres were planted to alfalfa, fodder crops, sugar beets, hops and cotton.

In 1918 the California State Board of Health adopted regulations concerning use of sewage effluents for irrigation, which prohibited irrigation of berries and salad vegetables; permitted irrigation of vegetables harvested in the dry state; and permitted, under restrictions, such uses as (1) for garden truck if not watered 1 month before harvesting; (2) orchards, if windfalls were not gathered for human consumption; (3) melons if raised on hills above the water; and (4) fodder crops if milk cows were excluded from the fields.

Under the regulations, health officials were obviously required to supervise the growers and the regulations proved unsatisfactory.

In recent years, with increasing population, shrinkage of water supplies and improved methods of sewage treatment, several groups urged wider use of sewage effluents for irrigation which could not be done under the then existing regulations.

Under all the circumstances a revision of the regulations seemed advisable, and after a series of conferences with health officers and sewage disposal experts, new regulations were decided upon and adopted in May, 1933, based on classification of sewage effluents as well as on crops to be irrigated.

The aim was to minimize the supervision of the growers by health departments and, instead, to concentrate efforts on operation of the sewage treatment plants and the character of effluent produced.

In brief, the present rules forbid the use of raw sewage and raw or undigested sludge for irrigation of growing crops; make no restrictions on use of well oxidized, highly disinfected effluents; and permit the use of settled and undisinfected effluents on nursery and fodder crops, cotton and sugar beets but not on vegetables, berries and low-growing fruits.

Since sewage irrigation is considered an integral part of sewage disposal, the intention is that its regulation in California be handled under the permit features of the Public Health Act. This Act governs all forms of sewage disposal.

Treatment and Disposal of Sewage in the National Parks*

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SINCE 1922, sanitary engineers of the U. S. Public Health Service have been detailed to the National Park Service to assist superintendents of national parks, custodians of national monuments, and engineers of the Park Service on problems of sanitation in the parks and at monuments. The work of the sanitary engineers has included surveys and reports of investigations of water supplies, sewerage and sewage disposal, garbage disposal, swimming pools, mosquito control, and general inspections of all places handling and serving food products. In addition, plans have been prepared for water supply systems, sewage treatment plants, and garbage incinerators.

The sewage treatment plants discussed in this paper have been constructed in the parks in the Western Division of the National Park Service. In this division, which includes the National Parks west of the Mississippi River, except Hot Springs National Park, Arkansas, there are 19 parks located as follows: 1 in Alaska, 1 in Arizona, 4 in California, 2 in Colorado, 1 in the Hawaiian Islands, 1 in Montana, 1 in New Mexico, 1 in Oregon, 1 in Oklahoma, 1 in South Dakota, 2 in Utah, 1 in Washington, and 2 in Wyoming. All, except Hawaii, are located in sections or at elevations where there are more or less severe winters. Some are practically inaccessible in winter, others are visited by parties on snow shoes or skis, and 10, which include Carlsbad Caverns, General Grant, Grand Canyon (South Rim), Hawaii, Mount Rainier, Platt, Rocky Mountain, Sequoia, Yosemite, and Zion, are open to tourists by train or automobile throughout the year.

In 1933, the number of visitors was 2,013,024. The maximum number visiting one park was 296,088 at Yosemite, and the smallest, 368, at Mount McKinley. The parks having over 100,000 visitors were: Yosemite, 296,088; Rocky Mountain, 291,934; Hawaii, 237,690; Platt, 220,606; Mount Rainier, 170,104; Yellowstone, 161,938; Sequoia, 126,464; and Grand Canyon, 105,475. There is in addition to the visitors a permanent population which varies from a few in the smaller and less patronized parks to approximately 1,500 in Yellowstone.

The accommodations for visitors in the parks are hotels, lodges, housekeeping cabins, and automobile camp grounds, and for the permanent population residences and dormitories. The locations of these accommodations in

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the various parks vary widely. At the South Rim of the Grand Canyon practically all the visitors and employees live in one area, whereas in Yellowstone there is 1 area with all the accommodations listed above, 4 with all the accommodations except residences, 2 other places with lodges, housekeeping cabins, and large camp grounds, and several other smaller areas having automobile camps. The maximum number of people in one area in a park was 23,000 in Yosemite Valley on July 4, 1932. In Yellowstone there are 6 areas where the total population will vary from 100 to 2,500 people, and other places, mostly automobile camps, where the number of tourists will range from 25 to 100. In Yosemite Valley there were at one time 9,000 visitors living in tents in tourist camps, and in Yellowstone 800 in each of 2 camps.

There are in the western parks, 65 areas having for visitors extensive accommodations which are generally grouped together and served by a common water supply system, sewerage system and disposal plant, garbage incinerator, and other public utilities.

There have been constructed 52 sewage treatment plants since 1922. In designing these plants the important considerations were: (1) protection of streams against contamination and in one park reclamation of sewage for industrial purposes; (2) prevention of odor nuisances; and (3) maintaining architectural and landscape values. The treatment plants constructed include (a) activated sludge, rapid sand filter and disinfection; (b) activated sludge and disinfection; (c) settling tanks and disinfection; (d) settling tanks and spraying systems which distribute settled sewage, with and without disinfection, over natural ground surfaces, usually hillsides of porous material; (e) settling tanks and sub-surface galleries with concrete, wood, or metal walls and covers; (f) settling tank and glass-covered sand filter; (g) settling tanks and open trenches; and (h) settling tanks, broad irrigation, ponds and disinfection. Following are descriptions of a representative plant of each of the types listed above.

ACTIVATED SLUDGE, RAPID SAND FILTER AND DISINFECTION

The cost of hauling water to the South Rim of the Grand Canyon National Park in tank cars and delivering it in service lines, prior to 1932 was $3.07 per 1,000 gallons and approximately $2.50 for pumping and delivery since that date. In order to reduce the volume of water hauled, a pressure sand filter was added in 1913 to an existing sewage treatment plant, consisting of septic tank and contact filter, to produce an effluent which could be used in place of fresh water for irrigation of lawns and making steam. For a few years following 1913 the effluent was apparently satisfactory for the purposes noted, but with an increasing volume of sewage the plant became badly overloaded, a serious odor nuisance developed, and the effluent could not be used on lawns because of the odors, or in boilers due to foaming.

It was decided in 1926 to build a new sewage treatment plant to produce an effluent which could be used for industrial purposes and be distributed in a separate piping system properly protected against cross-connections, without being a serious health hazard to the visitors and people living at the South Rim.

A treatment plant consisting of settling tank, slow sand filters, and disinfection seemed to have the most inherent advantages from the standpoint of high removal of bacteria and quality of effluent in general, and low cost of operation and maintenance, but it was impracticable to build this type of plant on account of the high cost of sand delivered to the South Rim. The

FIGURE I—Sewage Treatment Plant, Grand Canyon National Park

treatment plant designed included activated sludge, rapid sand filters, and disinfection.[1, 2] The local conditions, other than those pertaining to the industrial uses of the reclaimed sewage, which had to be given consideration in the design of the treatment plant, were the variations in the temperature of the raw sewage, from 92° F. in summer to 72° F. in winter, and the treatment of the laundry wastes, which constitute approximately 10 per cent of the total volume. Figure I shows a general view of the treatment plant.

The available data indicated that the maximum volume of sewage produced at the Canyon during 1926 was 100,000 gal. per day, and the treatment plant was designed to treat 200,000 gal. The following devices were included in the plant:

Screen—The screen is 3′ wide by 3′ deep and has ⅜″ by 2″ rectangular iron bars spaced 2⅜″ on centers.

Pre-settling tank—This tank is 16′ by 8′, with an effective depth of 5′ to the top of the two hoppers which are 4′ deep. The theoretical detention period is 30 minutes for a maximum volume of 200,000 gal. of sewage per day.

Diversion chamber—This is a small tank located on the pipe line from the pre-settling tank to the aeration tanks. It receives the activated sludge returned from the clarifier to the aeration tanks and can be used for by-passing the sewage around the plant.

Aeration tanks—There are two of these tanks, each 42′ by 8′ by 10′ deep below the water level. They were designed for an average aeration period of 6 hours.

In each tank there are two continuous concrete channels each 42′ long and having at the top porous plates which rest on T-irons across the channels and in recesses along the sides of the channels, and which are held in place by cement grout. There are concrete ridges between the channels. The air is pumped through 4″ pipes to one end of the channels, and at the opposite end there are 4″ outlet pipes which permit flushing of the channels and cleaning the under surfaces of the porous plates with water or steam. The tanks were designed so that they can

be operated in series or separately.

Clarifier—This tank is 16′ square with an effective depth of 11½′. It has a settling rate of practically 800 gal. per sq. ft. per day, and a theoretical detention period of 2 hours when sewage is flowing through at a rate of 200,000 gal. per 24 hours. The influent enters the tank through 4 openings spaced equidistant along one side and 1′ below the water surface, and the effluent flows over a brass weir the full width of the tank. There are inlet and outlet baffles extending 3′ below the water level. The activated sludge moved by the scrapers of the clarifier to the center of the tank is returned to the aeration tanks by an air lift.

Coagulation tank—This tank, originally designed as a coagulation basin to be used in connection with operation of the rapid sand filter, is 16′ by 4′ by 10′ deep. Up to the present time, the filters have operated satisfactorily without the use of coagulants and this tank has been used as a secondary settling tank.

Rapid sand filters—There are 2 of these filters each having an area of 77 sq. ft. The wash-water troughs are of concrete and the underdrainage consists of 12″ headers with 1¼″ cast iron laterals having ¼″ holes bored on 3″ centers. Each filter has 20″ of graded gravel and 32″ of sand with an effective size of 0.40 mm. and a uniformity coefficient of 1.6. Reclaimed sewage, disinfected, is used for washing the filters.

Disinfecting equipment—Duplicate semi-automatic chlorine machines are used for disinfecting the effluent from the sand filters.

Blowers—Two blowers each with a capacity of 225 cu. ft. of free air per minute against 6½ lb. pressure per sq. in. at an altitude of 6,500′, supply the aeration tanks and air lift with air.

TABLE I

B. COLI IN RECLAIMED SEWAGE, GRAND CANYON NATIONAL PARK

Year	Source	No. samples tested for B. coli	No. samples having 3 or more 10 c.c. portions positive	Per cent samples having 3 or more 10 c.c. portions positive	No. 10 c.c. portions tested for B. coli	No. 10 c.c. portions positive	Per cent 10 c.c. portions positive
1929	Storage tank *	40	0	0	225	13	5.8
	Power house †	39	0	0	218	10	4.6
	Total	79	0	0	443	23	5.2
1930	Storage tank	87	1	1.2	435	21	4.8
	Power house	90	0	0	450	29	6.4
	Total	177	1	0.56	885	50	5.6
1931	Storage tank	54	0	0	270	15	5.5
	Power house	60	1	1.7	300	19	6.3
	Total	114	1	0.88	570	34	5.9
1932	Storage tank	73	0	0	365	21	5.8
	Power house	47	0	0	235	8	3.4
	Total	120	0	0	600	29	4.8
1933	Storage tank	40	1	2.5	200	10	5.0

* Tank located 1½ miles from treatment plant and has capacity of 200,000 gal.
† Samples collected from make-up tank which receives reclaimed sewage from storage tank.

TABLE II
CHEMICAL ANALYSES OF RAW AND RECLAIMED SEWAGE
GRAND CANYON NATIONAL PARK

Month 1933 1934	Suspended matter p.p.m.			Settleable solid c.c. per liter 1 hour		Dissolved oxygen p.p.m.		Oxygen demand p.p.m.			Soap hardness p.p.m.		Hydrogen ion concentration		
	R	C	C. W.	R	C	C. W.	P. H.	C	C. W.	P. H.	R	C. W.	R	C	C. W.
January	104	10.0	0.3	8	0.3	7.3	8.2	6.8	1.8	1.5	21.0	14.8	7.6	7.2	7.5
February	74	10.0	0.3	6	0.25	7.4	8.5	7.3	1.6	1.4	25.0	16.6	7.5	7.2	7.4
March	111	9.0	0.3	9	0.24	7.3	8.3	7.2	1.3	1.3	21.7	17.7	7.5	7.1	7.3
April	91	10.0	0.3	7	0.28	7.0	8.0	6.8	1.3	1.2	21.3	19.2	7.5	7.2	7.4
May	103	11.0	0.3	8	0.29	6.7	7.3	6.3	1.6	1.6	20.0	20.8	7.5	7.2	7.4
June	163	9.0	0.3	10	0.24	5.6	6.0	5.3	1.3	1.4	22.7	15.9	7.5	7.2	7.3
July	105	11.0	0.3	8	0.3	4.5	5.2	4.3	2.5	1.8	20.9	17.5	7.6	7.2	7.3
August	120	12.0	0.3	10	0.3	4.4	5.0	3.8	1.3	0.9	23.2	18.4	7.5	7.3	7.4
September	105	8.0	0.27	8.2	0.2	4.6	5.8	4.4	1.9	1.3	19.0	16.5	7.5	7.3	7.4
October	86	11.0	0.3	7	0.27	5.2	5.7	4.9	2.0	1.4	17.3	16.0	7.5	7.3	7.4
November	93	9.0	0.3	7	0.2	5.0	5.5	4.6	1.7	1.2	19.0	14.2	7.5	7.2	7.4
December	90	10.0	0.3	7	0.27	5.2	5.8	5.0	1.7	1.2	20.8	19.1	7.5	7.2	7.4
January	88	10.0	0.25	7	0.26	5.3	5.6	5.1	1.3	1.1	20.9	16.9	7.5	7.2	7.4
February	101	10.6	0.18	8.3	0.31	5.3	5.5	5.1	1.6	1.6	20.5	17.0	7.5	7.3	7.5
March	89	9.7	0.17	7.4	0.24	5.3	5.8	4.1	2.5	1.4	22.8	14.0	7.6	7.3	7.4
April	94	11.2	0.18	7.8	0.28	4.2	4.9	4.2	2.6	1.8	21.5	15.3	7.6	7.2	7.5
May	92	9.6	0.11	7.6	0.24	4.6	5.2	4.6	2.2	1.7	20.5	19.2	7.7	7.1	7.4
June	97	12.5	0.1	8.1	0.2	3.6	4.3	3.6	2.9	2.1	22.6	21.1	7.6	7.2	7.4
July	88	14.0	0.1	7.4	0.35	2.7	3.2	2.6	1.8	1.7	23.8	20.3	7.6	7.2	7.5

Note R—Raw sewage. C. W.—Clear well.
C—Effluent clarifier. P. H.—Tap at make-up tank in power house.

Wash-water storage tank—This tank, which is used to store the wash water from the filters, is 25′ long by 16′ wide and 4½′ deep below the overflow. A small centrifugal pump returns the wash water to the pre-settling tank.

Pumping equipment—The final effluent from the plant is pumped through 1½ miles of 4″ pipe to a 200,000 gal. elevated tank by two 3-stage centrifugal pumps.

In Tables I, II, and III are given, respectively, the *B. coli* density in the reclaimed sewage for the years 1929 to 1933 inclusive, the monthly averages of chemical analyses, and data pertaining to the operation of the treatment plant for 1933 and up to August, 1934.

Handling reclaimed sewage—All the pipe lines carrying reclaimed sewage are enclosed in vitrified pipe and all pipes in buildings or above ground are painted red, and over every service outlet there is a sign warning against drinking the water. The tank in which the reclaimed sewage is stored is 125′ lower than the tank used for domestic water. Accurate maps of the 2 water systems are kept up to date. Beginning in October this year a dye solution strong enough to give a color to the reclaimed sewage will be added once

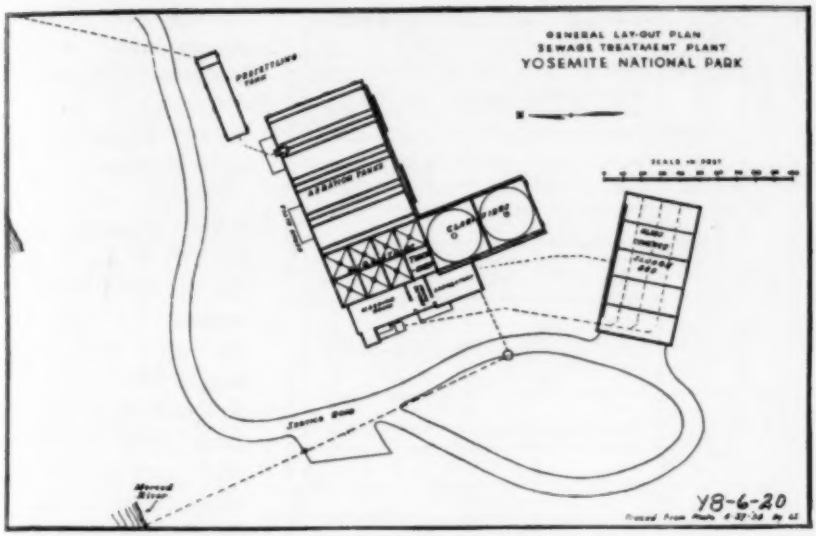

FIGURE II—Sewage Treatment Plant, Yosemite National Park

a month to the effluent at the treatment plant.

Uses of reclaimed sewage—The reclaimed sewage is used in locomotive boilers, boilers for heating purposes, for watering lawns and flowers at the El Tovar Hotel, for flushing toilets in public comfort stations, washing automobiles, cooling water in jackets of Diesel engines, and in pipes used for drying garbage in an incinerator.

Cost of reclaiming sewage—The cost of operating the treatment plant, exclusive of interest and depreciation, but including pumping the reclaimed sewage to the storage tank, averages approximately $0.38 per 1,000 gal.

ACTIVATED SLUDGE AND DISINFECTION

In 1930 there was constructed in Yosemite Valley in Yosemite National Park, an activated sludge plant[3, 4] to replace an Imhoff tank and natural sand filters which were badly overloaded and producing offensive odors. Yosemite Valley, at the only place where a new sewage treatment plant could be located, is approximately 1 mile in width with vertical walls about 3,000′ in height, and there are two highways, one on each side of the river which flows through the valley. On account of the odor nuisance and bad appearance of the old treatment plant, and the unfavorable topography of the floor of the valley, with regard to suitable sites for a new plant, local sentiment in the valley was doubtful that any type of treatment plant would operate without some kind of nuisance. The stringent requirements which the new plant had to meet were (a) that there would be no odors, (b) that the plant could not be seen from the highways on the floor of the valley or on slopes leading out of the valley, (c) that there would be no noise, (d) that the Merced River, which is used as a source of domestic water supply, would not be contaminated, and (e) that fish in the river would not be killed by chlorine in the effluent.

The treatment plant was designed for a maximum of 1,200,000 gal. of sewage daily, which was approximately twice the maximum flow up to 1930. Practically all of the sewage is pumped to the plant at a rate of 850 gal. per minute, which, while the pumps are operating, gives a rate of flow of 1,200,000 gal.

TABLE III

OPERATING DATA SEWAGE TREATMENT PLANT, GRAND CANYON NATIONAL PARK

(Figures represent monthly averages of daily records)

Month 1933 1934	Sewage flow 1,000 gallons daily	Reclaimed sewage 1,000 gallons daily	Temp. deg. F.		Sludge wasted 1,000 gallons		Aeration tanks			Sand filters		Chlorine		
			Raw	Effl.	Raw	Active	Per cent sludge in tanks	Aeration hours	Cubic feet* air used per gal.	Rate† filtration m.g.d.	Per cent wash water	lbs.	p.p.m.	Resid. p.p.m.
January	76	75	70	62	0.6	0.2	23	10.2	4.0	23	6.7	2.7	5.6	0.8
February	68	67	70	61	0.6	0.3	25	10.3	4.4	21	7.4	3.1	6.0	0.8
March	69	68	76	66	0.6	0.3	24	10	4.3	21	7.3	3.7	6.7	
April	93	92	78	66	0.6	0.3	22	10	3.3	28	5.6	3.6	6.0	0.8
May	102	101	80	67	0.6	0.5	25	9.2	3.0	31	5.1	4.1	4.8	0.8
June	103	102	74	82	0.6	0.6	25	8.9	3.0	31	5.0	3.8	4.5	
July	105	104	86	78	0.6	0.4	24	8.8	2.9	32	6.2	4.6	6.0	1.0
August	112	103	84	78	0.6	0.8	25	8.7	2.7	34	5.8	5.6	5.9	0.8
September	108	107	84	77	0.6	0.6	25	8.5	2.8	33	6.3	4.6	6.1	0.8
October	103	102	82	75	0.6	0.7	26	8.9	2.9	31	6.3	4.8	6.1	0.8
November	96	94	79	71	0.6	0.6	24	9.6	3.1	29	6.8	4.5	6.4	0.8
December	99	97	75	68	0.6	0.5	25	9.2	3.1	30	6.5	4.5	4.6	0.8
January	95	92	68	75	0.6	0.4	24	10	3.2	29	6.8	4.6	5.	0.8
February	96	92	84	72	0.6	0.7	25	9.9	3.3	29	6.8	5.3	6.5	0.8
March	101	100	72	79	0.6	0.8	21	9.7	3.1	31	6.4	4.9	7.	0.7
April	109	107	85	77	0.6	1.2	29	8.1	2.8	33	5.9	7.4	6.9	.44
May	105	103	86	78	0.6	1.6	26	8.7	2.9	32	6.2	5.2	5.1	.52
June	112	110	89	80	0.6	1.0	27	8.2	2.7	34	5.8	5.6	6.	.43
July	110	109	93	86	0.6	0.8	27	8.3	2.8	33	5.9	6.1	6.7	.46

* Air supplied at a uniform rate of 225 c. f. m. No deduction for air lift. † Average rates; maximum rates are approximately twice the averages.

through the plant. The general layout of the plant is shown in Figure II.

The plant has the following treatment devices and equipment:

Coarse screens — The screen chamber, which is 7½′ by 5′ by 2′ deep below the outlet, has two bar screens, one with 2″ and the other with 3″ openings. The screens were designed primarily to remove coarse material which might clog the 12″ siphon which begins at the screen chamber and extends under the river to the pre-settling tank.

Pre-settling tank — This tank is 40′ by 10′ by 16′ deep to the bottom of the hoppers, and has a concrete cover. The theoretical detention period is 45 minutes when treating 850 gal. per minute, the capacity of the pump normally used to lift the sewage to the gravity line to the treatment plant. There is a baffle at the inlet but only a skimming weir at the outlet. The sludge is drawn from the hoppers to the thickening tank daily during the period of maximum travel to the park.

Aeration tanks — There are 4 aeration tanks of the Manchester type, each 50′ by 18½′ and 12′ effective depth. There are in each tank, two rows of porous

TABLE IV

B. COLI IN EFFLUENT OF SEWAGE TREATMENT PLANT AND IN MERCED RIVER ABOVE AND BELOW OUTLET OF PLANT, YOSEMITE NATIONAL PARK
PERIOD—JANUARY 1, 1932, TO AUGUST 4, 1934

SOURCE	Number of 10 c.c. portions tested for B. coli			Per cent 10 c.c. portions positive for B. coli			Number of 1 c.c. portions tested for B. coli			Per cent 1 c.c. portions positive for B. coli		
	1932	1933	1934	1932	1933	1934	1932	1933	1934	1932	1933	1934
Merced River 2 miles above treatment plant	251	186	155	63	38	17	39	50	31	36	34	6.5
Merced River 1 mile below treatment plant	263	192	155	62	40	22	38	52	31	37	30	13
Merced River * at park boundary	254	191	155	50	40	25	38	52	31	18	23	9.7
Effluent † treatment plant 8:30 A.M.	259	260	150	20	2.3	2.7	36	52	30	14	1.9	0.0
Effluent † treatment plant 10:00 A.M.	258	249	140	23	2.4	2.8	36	51	28	17	0.0	0.0
Effluent † treatment plant 11:30 A.M.	238	249	140	23	2.0	5.0	31	50	28	19	0.0	0.0

* Approximately 8.5 miles below treatment plant.
† After disinfection.

plates set over continuous channels extending the length of the tanks. The plates were set in recesses along the sides of the channels and on flat aluminum bars across the channels. Cement grout was used to hold the plates in place and make airtight joints. Air is applied at one end of the channels and at the opposite ends there are outlets for flushing them and washing the under surfaces of the plates. Tanks 1 and 2 are arranged for operation as single units, in series or in parallel, and tanks 3 and 4 in series with 1 and 2. The tanks were designed for a theoretical aeration period of 5½ hours with 20 per cent activated sludge.

Final clarifiers—The two clarifiers, each 28′ square at the top and with circular bottoms, have 11′ and 10′ effective depths, respectively, and are operated in series. Each tank was designed for a settling rate of 1,600 gal. sewage per sq. ft. per day and has an inlet baffle 5½′ deep. Sludge is drawn by air lifts from the first unit to the

FIGURE III—Yosemite National Park Sewage Treatment Plant Showing Machinery Room, Laboratory and Office Building and Glass Covered Sludge Bed

aeration tanks and from the second unit to the pre-settling tank. Liquid chlorine is applied to the influent to the second clarifier by full automatic chlorinators in duplicate.

Thickening tank—This tank is 12′ by 13′ by 13′ deep to the hopper bottom. Sludge is discharged into this tank by gravity from the pre-settling tank and the first clarifier. The concentrated sludge is pumped to the digestion tanks and the decanted liquor to the pre-settling tank.

Digestion tanks—There are 4 covered sludge digestion tanks, 3 of which are 28′ by 12′ by 18½′ deep to the bottom of the hoppers, and the fourth, 13′ by 12′ by 18½′. There are concrete domes for collecting gas, coils around the walls for heating the sludge, and a pump for delivering sludge to the tanks and for circulating the sludge. Digested sludge flows by gravity to the sludge drying bed.

Sludge drying beds — The glass covered sludge drying bed is divided into 5 sections, each 15′ by 40′ and has 1′ of river sand with underdrainage connected to a pipe line leading to a pump sump.

Drainage sump—The waste liquors from the digestion and thickening tank, drainage from sludge beds, the wastes from laboratory and toilets, and all other liquid wastes from the plant, other than the disinfected effluent, are discharged into the drainage sump and pumped to the pre-settling tank.

Blowers—There are two centrifugal blowers, each with a capacity of 425 cu. ft. free air per minute against a head of 7 lb. at an elevation of 3,000′.

Operation of treatment plant—The plant is under the direct supervision of two operators between 8 A.M. and 2 A.M., with no one at the plant from 2 A.M. to 8 A.M. In addition to operating the plant, the operators inspect and keep in working order the ventilating apparatus at the Wawona Tunnel, and one of the operators makes the chemical analyses of sewage and bacteriological analyses of samples from the effluent of the plant, and water and

milk collected at various places in the park. Three samples of the effluent and 3 from the Merced River above and below the outlet of the plant are shipped to the U. S. Public Health Service Laboratory in San Francisco each week for bacteriological analysis. The treatment plant has been in continuous operation since August, 1931, and except for bulking of sludge in the aeration tanks at infrequent intervals, and minor troubles with the mechanical equipment, it has operated in a highly satisfactory manner. Figure III shows the laboratory and office building and glass covered sludge bed. Table IV gives the density of *B. coli* in the effluent of the treatment plant and in the Merced River above and below the outlet from the plant to the river.

On account of the many duties each operator has to perform at the treatment plant during his shift, it is necessary to limit the chemical analyses to those essential to the operation of the plant and to a knowledge of the character of the effluent discharged to the river. Table V gives operating data and the chemical analyses, except the suspended matter in the raw sewage which is determined only occasionally in composite samples collected on Sunday, which is the day of the week ordinarily with the heaviest travel to the park. The suspended matter in the sewage produced on Sundays averages between 100 and 125 p.p.m.

SETTLING TANKS AND DISINFECTION

Settling tanks with disinfection of the effluent, have been used for treating sewage at places in the parks where large rivers or lakes, which are not used as sources of domestic water supplies, are available for receiving the sewage. This type of plant is used at 7 places in Yellowstone Park where there are large hotels, lodges, and camp grounds. The design of the settling tank used is shown in Figure V.

A uniform amount of chlorine, which is sufficient to disinfect the sewage at the maximum rate of flow, is added continuously to the effluent of a settling tank as it is discharged through vitrified pipe to the bottom of a contact tank which has a detention period of approximately 15 minutes at the time of maximum flow of sewage through the tank.

An inspector visits these plants daily to test the effluent for free chlorine and adjust the chlorine dosage. In adjusting the flow of chlorine to the maximum rate of flow of sewage, there is a fairly high chlorine residual during the night, but it has never had any effect on fish in the streams receiving the sewage. An attempt is made to maintain a chlorine residual of not less than 0.5 p.p.m. at all times.

In the fall of the year all the sludge is either drawn off from the tanks by gravity to prepared beds, or it is pumped out by portable gas-engine-driven diaphragm pumps and the tanks emptied and cleaned.

SETTLING TANKS AND SPRAYING SYSTEMS

In many of the national parks there are hotels, lodges, and tourist camps located in places, usually in the mountains, where the topography and other local conditions are unfavorable for the location, construction, and operation of the commoner types of sewage treatment or disposal plants, and where it is much less expensive and often more satisfactory in many ways to treat the sewage in settling tanks and spray the effluent, disinfected when advisable, over natural ground surfaces, usually hillsides of porous material and covered with vegetation. This method of sewage disposal is generally used at areas

TABLE V

OPERATING DATA AND CHEMICAL ANALYSES, SEWAGE TREATMENT PLANT YOSEMITE NATIONAL PARK

Month 1933 1934	Sewage flow 1,000 gal. daily	Aeration tanks				D. O. final effluent	B. O. D. effluent clarifiers p.p.m.		Sludge digestion tanks		Chlorine		
		Cu. ft. air per gal. sewage	Per cent settleable solids	Per cent suspended solids	pH effluent	p.p.m.	first	second	pH	Temp. deg. F.	lb. per day	p.p.m.	Resid. p.p.m.
Jan.	73	10.	18	0.22	6.5	9.4	6.6	0.6	7.1	63	19	31	1.9
Feb.	62	8.7	23	0.24	6.5	10.9	4.2	1.4	7.1	58	9.3	18	1.8
Mar.	84	5.8	24	0.19	6.8	10.5	4.3	2.1	7.2	59	9.0	13	1.8
Apr.	207	2.6	21	0.19	6.2	9.7	4.3	2.0	7.2	65	12	6.9	2.0
May	272	1.7	20	0.19	6.3	9.1	3.8	1.0	7.2	67	16	7.1	2.1
June	661	1.7	19	0.21	6.1	6.3	5.1	2.0	7.1	64	40	7.3	1.8
July	665	1.9	20	0.23	6.0	4.3		1.3	7.1	66	65	12	1.8
Aug.	540	2.7	23	0.21	5.9	6.1	4.4	0.9	7.4	75	39	12	2.0
Sept.	363	2.0	23	0.22	6.2	6.5	4.6	0.9	7.3	75	24	7.9	2.3
Oct.	233	3.1		0.17	6.3		5.8		7.3	84	12	6.3	2.1
Nov.	164	4.1	12	0.10	6.6	8.7	5.2	1.3	7.2	80	10	7.3	2.7
Dec.	161	3.3	11	0.12	6.4	8.9	4.9	1.1	7.3	73	8.6	6.4	1.8
Jan.	186	3.3	11	0.11	5.8	8.7	5.7	0.9	7.2	71	13	8.4	
Feb.	189	3.3	12	0.11	5.9	9.0	6.0	1.4	7.2	72	12	7.8	
Mar.	254	2.4	9.5	0.08	6.1	9.4	5.7	1.4	7.4	68	12	5.5	
Apr.	360	1.5	11	0.10	6.2	8.3	6.5	1.4	7.3	75	15	5.1	2.1
May	537	1.7	8.7	0.11	6.0	7.2	6.8	1.8	7.4	75	33	7.3	
June	645	1.9	13	0.13	5.8	6.2	5.7	1.2	7.1	70	72	13	2.4

Note: Figures in table represent averages of daily records.

which are open to visitors only during the warmer seasons, and when there is little rainfall. There are 10 of these plants in the parks, with disinfection of the effluent at 3. Typical examples of this type of treatment plant are at Giant Forest and Lodgepole Camp in Sequoia National Park.

At Giant Forest, with a population of approximately 1,000 during the summer, the sewage is treated in a settling tank and the effluent applied by a siphon to sprays which are set in a pipe line approximately 800′ long and operate under a head of approximately 50′. Below the sprays there is a heavy growth of trees and shrubbery and the soil for a depth of 2′ is porous. The spraying system is located where the drainage area above is small and where the nearest stream below is approximately 1 mile away. The loose material and the vegetation absorb practically all of the effluent and no sewage has ever been found flowing over the ground at a distance of more than 500′ below the sprays. This plant has been operated during the summer and fall months for 7 years. There is a slight odor of fresh sewage at the settling tank and where the sewage is sprayed over the hillside, but it cannot be detected 100′ from the disposal plant. The absence of an odor nuisance at this and at most of the plants is due no doubt to the fact that the sewage is unusually fresh when it reaches them and that there is little decomposition in the settling tanks.

At the Lodgepole Camp, the sewage from an automobile tourist camp with a population of approximately 300, and a government utility area with 25 employees, is treated in a settling tank and the effluent, disinfected with chlorine, is applied by alternating siphons to sprays set on 2 separate pipe lines each 300′ long and approximately 15′ below the siphons. There are trees and shrubbery below the sprays and the soil is sandy and loose. The effluent is disinfected to protect a stream which receives drainage from the area where the sewage is sprayed.

The areas used for the spraying systems at the different plants are selected where there is little drainage above and where the sewage will be sprayed over ground having no well defined depressions or channels. Whenever the sewage begins to flow in channels the adjacent sprays are closed and the ground is allowed to dry, and the soil raked. The design of the spraying system is shown in Figure IV.

SETTLING TANKS AND SUBSURFACE GALLERIES

In many areas where there are accommodations for a comparatively small number of visitors and where it is advisable for various reasons to have the sewage disposal system entirely below the surface of the ground, settling tanks and subsurface galleries are used. In these areas careful investigations are made to find suitable porous material, such as gravel or coarse sand.

The settling tanks, which are used from 4 to 6 months in the year, are cleaned each fall. These are designed for a capacity equal to the largest volume of sewage produced daily, with approximately an additional one-third capacity for storage of sludge. All the settling tanks which have been constructed have been designed on the above basis, and all of them are cleaned once a year. The filter galleries are open at the bottom and the covers consist of either concrete, redwood, or half-round corrugated galvanized iron. The half-round culvert pipe can be obtained in diameters ranging from 8″ to 86″. The length and width of gallery used in any particular case depends on the volume of sewage treated and the character of the subsoil. A typical disposal

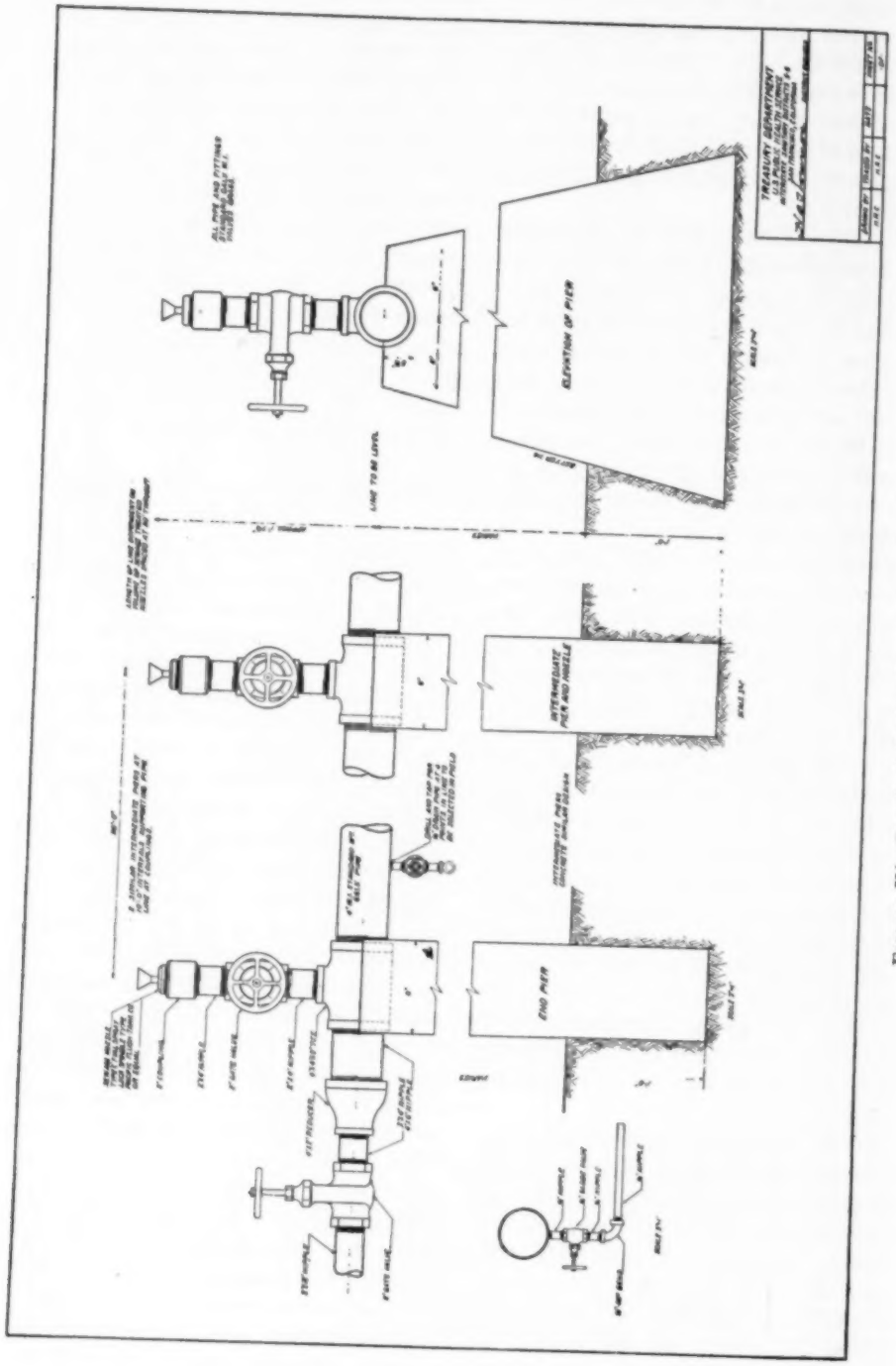

FIGURE IV.—Standard Design Sewage Spraying System

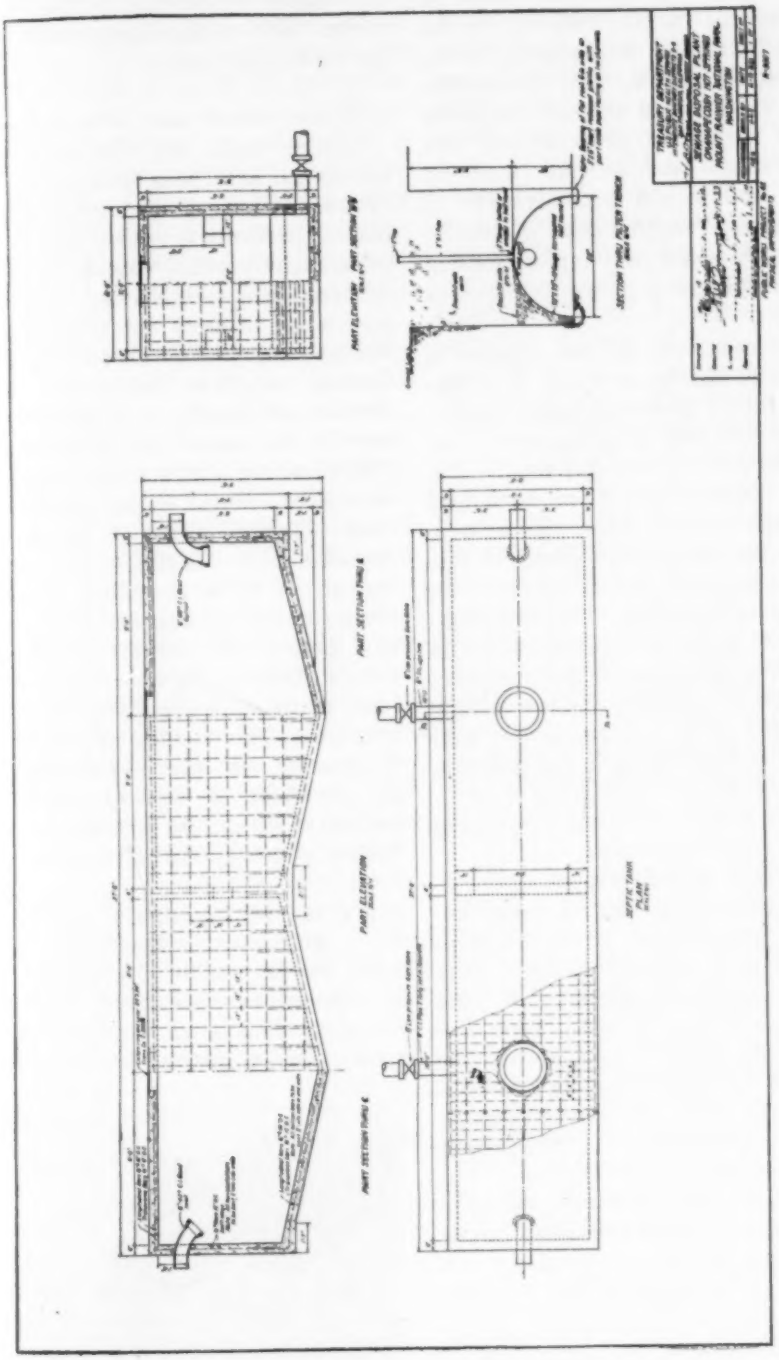

FIGURE V—Settling Tank and Sub-surface Gallery

plant of this type was constructed at Zion National Park to take care of the sewage from the headquarters area, housekeeping cabins, and automobile camp. In this area the only available site for a disposal plant is near the cabins, camp, and grounds used by visitors, and it was not advisable to have a sewage disposal plant above the ground. A design of a typical settling tank and subsurface gallery is shown in Figure V.

The effluent from the tank is piped to a diversion box from which it is discharged into 3 subsurface galleries each 100′ in length and 5′ in diameter. The subsoil is loose gravel and rock. The tank is covered with 2′ of earth and the galleries are 5′ below the surface.

There are 14 disposal plants of this type in the parks and all of them are operating satisfactorily. The main considerations which govern the successful operation of this type of plant are adequate storage for sludge and low settling rate in the settling tanks, porous subsoil, and sufficient area in the galleries.

SETTLING TANKS AND GLASS COVERED SAND FILTER

On account of unfavorable local conditions, particularly limited space, impervious subsoil and winter temperatures as low as —35° F., a septic tank and a covered intermittent slow sand filter, divided into 2 beds, were constructed in 1926 to dispose of the sewage from approximately 50 employees and their families in summer and 30 in winter, at the government utility area in Rocky Mountain National Park. The roof over the sand filter consists of wood with glass on the side exposed to the sun in winter. A general view of the sand filter is shown in Figure VI.

The effluent from the septic tank is applied to the sand filter by an automatic siphon. No difficulties have been experienced in operating the filter in the winter with temperatures below zero for weeks at a time.

SETTLING TANKS AND OPEN TRENCHES

Settling tanks and open trenches in porous soil have been found a practical method of sewage disposal in several places, particularly where there is a comparatively small volume of sewage produced and trenches can be dug in porous soil in areas not frequented by visitors and where other methods of disposal are not practicable. The trenches are usually 2′ in depth and 2′ wide at the bottom, and at intervals of 100′ there are dykes across the trench with pipes connecting the different sections. Disposal plants of this type are operated only during the summer season. A dense growth of algae develops in the sewage in the trenches and there are no odors noticeable 50′ away. Each spring about ½″ of surface material is removed from the trenches. This method of disposal is inexpensive, and where local conditions are favorable is a very satisfactory method of getting rid of sewage without danger of contaminating streams.

SETTLING TANKS, BROAD IRRIGATION, PONDS AND DISINFECTION

At the Mammoth Hot Springs area in Yellowstone Park there are housekeeping cabins, hotel, lodge, automobile tourist camp, general stores, with a

FIGURE VI—Glass Covered Sand Filter, Rocky Mountain National Park

permanent population consisting of employees of the government and public operators. This area is adjacent to the Gardiner River which is the emergency source of water supply for the town of Gardiner located on the river about 6 miles below the headquarters area. The population of the Mammoth Hot Springs area during the summer is approximately 1,250, and the permanent population during the winter averages about 125.

Two different methods of sewage disposal were considered for the Mammoth Hot Springs area. One included settling tanks, sprinkling filters, and disinfection of the final effluent which would be discharged into the Gardiner River, and the other included a settling tank and disinfection of the effluent which would be disposed or by broad irrigation, ponding, and disinfection of whatever sewage might overflow from the ponds. The latter method was adopted since it offered a greater measure of protection of the river against contamination, and the topography of the ground was favorable for this method of disposal. The component parts of the disposal system include settling tank, 3 chlorinators, broad irrigation, and ponds. One of the chlorinators is located at the headquarters area and is used to disinfect the small volume of raw sewage produced during the winter when the disposal plant is inaccessible on account of deep snow, and the other 2, one of which is used to disinfect the effluent from the settling tank and the other the overflow from the ponds, are operated during the summer and fall.

The effluent from the settling tank, during the time when the park is open to visitors and a large volume of sewage is produced, is discharged into open ditches which carry the sewage to the areas used for broad irrigation and to the ponds. During the winter the effluent from the settling tank does not overflow the ditches and ponds, and broad irrigation is not necessary. A small amount of sewage which flows out of the ponds during the summer is discharged onto a sand bar and no doubt eventually reaches the river, but since it has been treated twice with chlorine and stored several days in ponds it is not believed the small amount of overflow from the ponds seriously contaminates the river water. An inspector visits the disposal system daily to adjust the flow of chlorine and regulate the flow of sewage to the areas under irrigation and to the ponds.

There is a slight odor of fresh sewage at the settling tank and a swampy odor near the ponds.

A few bacteriological analyses of samples collected during the summer from the overflow from the ponds before final disinfection showed that the *B. coli* group of organisms was present only occasionally in 1 c.c. portions.

This disposal plant was inexpensive to construct, costs only a small amount to supervise and maintain, and has produced very satisfactory results.

SUMMARY

The uniform policy followed with regard to the disposal of sewage in the national parks has been to avoid contaminating streams or interfering in any way with the use of streams for fishing or recreation, and to locate, construct, and operate treatment and disposal plants so that they will not only be free of odors and any other nuisance, but will conform to the high standards of the Park Service in relation to architecture and preservation of the natural scenery in the parks.

ACKNOWLEDGMENTS

The writer is indebted to P. A. Sanitary Engineer O. C. Hopkins and Sanitary Engineering Assistant H. R. Carlson for valuable assistance in the preparation of this paper, and to Hillard Hall and Russell White, opera-

tors, respectively, of the treatment plants at the Grand Canyon and Yosemite National Parks, for data furnished regarding the operation of these plants.

REFERENCES

1. Hommon, H. B. Sewage Treatment Plant at the Grand Canyon National Park. *Reprint No. 1249* from *Pub. Health Rep.*, Oct. 5, 1928, U. S. Government Printing Office, Washington, D. C.
2. Hall, Hillard. Grand Canyon Activated Sludge Plant. *California Sewage Works J.*, V, 1, 1932–1933.
3. Hommon, H. B. Yosemite Valley Activated Sludge Plant. *California Sewage Works J.*, IV, 1, 1931.
4. White, Russell C. Operation of Yosemite Valley Activated Sludge Sewage Treatment Plant. *California Sewage Works J.*, V, 1, 1932–1933.

DISCUSSION

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MR. Hommon's paper is of particular interest to me because, in 1921, I had the privilege of assisting him when he inaugurated the present system of controlling sanitary conditions in our national recreation areas. Three years of work in the western group of parks gave me a comprehensive picture of the magnitude of this task and of the peculiar difficulties which had to be overcome. In 1923, I was directed to return to the east and, about 1930, due to constantly increasing National Park Service activities in the eastern section of the country, Eastern and Western Divisions were established. Supervision of sanitation in the Eastern Division, which included all areas east of the Mississippi River and, in addition, Hot Springs National Park in Arkansas, was lodged in my office. I continued in charge of this work until 1934.

In 1921, in what is now the Eastern Division, the National Park Service administered only 2 areas, Acadia National Park in Maine, and Hot Springs National Park in Arkansas. I believe that very few people realize to what extent the number of national recreational, monumental, and historical areas under the careful supervision of that service has increased. Contrasted with the 2 areas in 1921, a summary this year shows the following:

TABLE I

National Parks	5	
National Historical Parks	1	
National Monuments	9	
National Military Parks	11	
Battlefield Sites	10	
Miscellaneous Memorials	4	
National Cemeteries	11	51
National Parks (proposed) (Mammoth Cave, Shenandoah and Everglades)	3	
National Monuments (proposed)	2	5
National Capitol Parks		1
		57

These areas are not concentrated in any one section, but are well distributed throughout the East. Their geographical distribution is shown in Table II.

In the 2 older areas, Acadia and Hot Springs, sanitation has kept pace with the growth of the parks. Because of the importance of federal activities in the city of Hot Springs, the National Park Service is contributing generously to sewerage extensions and improvements and to new sewage disposal plants. The federal government's investment in those works has justified a controlling interest by the National Park Service in the selection of the designers and in the methods, efficiency, and continuity of plant operation. These interests are safeguarded in a

TABLE II

	Natl. Parks	*Natl. Parks (Proposed)*	*Natl. Historical Parks*	*Natl. Monuments*	*Natl. Military Parks*	*Battlefield Sites*	*Miscel. Memorials*	*Natl. Cemeteries*	*Natl. Monuments (Proposed)*
Maine	1	..	..	..	..	..	..	..	..
New York	..	..	..	1	..	1	..	..	..
New Jersey	..	..	1	..	..	..	..	..	..
Pennsylvania	..	..	..	..	1	1	..	1	..
Maryland	1	..	..	..	..	2	..	1	..
Virginia	..	1	..	2	2	1	1	3	..
North Carolina	1*	..	..	..	2	..	1	..	..
South Carolina	..	..	..	1	1	1	..	..	..
Georgia	..	..	..	1	1*	1	1	..	1
Tennessee	1	..	..	1	4	..	1	4	..
Florida	..	1	..	2	..	..	..	..	..
Kentucky	1	1	..	..	..	..	..	..	1
Ohio	..	..	..	1	..	..	..	..	..
Mississippi	..	..	..	..	1	2	..	1	..
Louisiana	..	..	..	..	..	1	..	..	..
Arkansas	1	..	..	..	..	..	..	..	..
District of Columbia	1	..	..	..	..	..	..	1	..

* Also enumerated in Tennessee.

formal contract. I understand that a reputable mid-western firm has recently been awarded the work of designing this project.

There was recently completed in Hot Springs, a sewage disposal project for the public camp ground which included a system of collecting lines leading to a settling tank, the effluent from which is automatically pumped into sewage trenches on the only available tract of land, a fairly steep hillside adjacent to the main highway. The construction of these sewage trenches which are merely devices larger than the customary tile lines to permit infiltering and seepage of clarified effluent into the ground, was complicated by heavy rock formations. Finally, blueprints had to be cast aside and sufficient patches of soil suitable for percolation sought on the ground. By this method we were able, eventually, to secure what we considered adequate seepage area. A similar system was designed for the principal public camp in Acadia. There, however, we were fortunate in having a small lake to receive the tank effluent.

One of the newer eastern areas, Colonial National Monument at Yorktown, Va., has received considerable attention. This monument has not yet developed to the point where a comprehensive sewerage project is warranted. Therefore, we solved the immediate problems by installing 4 separate settling tanks with arrangements for discharging clarified effluent into the ground. These installations were at different points in the federal territory, the idea being to provide sufficient facilities to care for the rapidly increasing tourist travel to this historical section. The need for definite and certain soil borings before the construction of any ground disposal scheme was demonstrated last year when we found one of our trenches ineffective. Tight soil, unobserved before design, has partially destroyed the usefulness of this particular installation and it will have to be expanded into a nearby area containing sandy loam of sufficient porosity to satisfy percolation requirements.

During the celebration of the Yorktown Sesquicentennial celebration in

1931, interesting problems were met in the provision of temporary sewage disposal facilities adequate to care for an estimated attendance of 100,000 people in 4 days. Utilizing large batteries of carefully attended and supervised pit privies, combined with a can system on a public water supply watershed, we successfully satisfied the needs of the situation without complaints.[1]

At the George Washington Birthplace National Monument, small settling tanks with provisions for ground infiltration of the effluent have been built in four places. Here, again, the character of the monument did not justify a single system. Incidentally, before the organization of the Eastern Division, Mr. Hommon had much to do with the original installations in Colonial and George Washington's Birthplace National Monuments.

The other areas in this division are so new or have been acquired so recently that the provision of sewage disposal facilities has not yet progressed far. However, because of the procurement of funds from the Public Works Administration and on account of the need for usefully employing people without work, much activity is contemplated in many areas and some is going ahead at once.

In both the Great Smoky Mountain National Park (Tennessee and North Carolina) and the Shenandoah National Park Project (Virginia) headquarters development, public camping areas, privately owned but governmentally controlled concessions, will all require systematically planned and substantial works for waste handling. These two large and beautiful areas situated in the midst of heavily populated sections will serve as recreation grounds for great numbers of people. These are not small areas. The final development authorized in the Great Smoky Mountain National Park includes 427,000 acres which makes it about two-thirds the size of Grand Canyon National Park, approximately four-sevenths as large as Yosemite National Park and somewhat larger than Sequoia National Park. A free and open park of this size in the center of the populous South is bound to attract many visitors.

Mammoth Cave National Park project (Kentucky) and the latest authorized one in the Florida Everglades; the National Historical Park at Morristown, N. J.; National Monuments like those at Fort Pulaski, Ga., and Fort Matanzas, Fla.; and National Military Parks such as Gettysburg, Shiloh, Vicksburg, Chattanooga and Chickamauga, are all being developed "for the benefit and enjoyment of the people." Keeping pace with the National Park Service, the Public Health Service will continue its coöperative efforts in the sanitary field insuring the guests of the national government the most adequate and convenient sanitary facilities possible under the circumstances existing at each site.

REFERENCE

1. Miller, Arthur P. Keeping a Celebration Area Clean. *Municipal Sanitation*, 3, 7, 1932.

Significance of Bacteriological Methods in the Diagnosis and Control of Whooping Cough*

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A YEAR ago at the meeting of this society we[1] reported our first year's experience with routine cough plate examinations for *B. pertussis*. We presented particularly the methods employed, a summary of the year's findings, and a discussion of the practicability of the procedure under the conditions in our community. In the present report we wish to add the data of the second year and point out the ways in which our laboratory findings are being applied in the local health department in a program of whooping cough control, and finally, to outline the criteria employed in our choice of cultures and technic for the preparation of specific vaccines used in our whooping cough prevention study.

A few comments on the *etiology of pertussis* are pertinent. Some workers have been deterred from attacking the pertussis problem because of the doubt raised by some, notably pathologists, as to the etiologic significance of *B. pertussis* and the emphasis they place on the possible rôle of an elusive filtrable virus in the disease. Intranuclear inclusions and interstitial bronchopneumonia have been noted in a certain per cent of pertussis autopsies. McCordock and Muckenfuss[2] regard this particular type of pneumonia as a type reaction to the presence of a virus and a bacterium. McCordock and Smith[3] have analyzed the various possible interpretations of their findings of inclusion bodies and interstitial bronchopneumonia in whooping cough. By analogy with swine influenza they suggest that since similar inclusions are sometimes found in children with no history of whooping cough, pertussis may be a mild virus disease which is of little consequence without a simultaneous or secondary bacterial infection complicating the condition. In other words, the Bordet-Gengou bacillus represents the bacterial component in a hypothetical virus-bacteria complex necessary for the production of the whole picture of whooping cough. Even were this proved, the diagnosis of the disease and probably specific methods for prevention would depend upon the bacterial component. The fact remains, however, that such a virus has not been demonstrated while the association of *B. pertussis* with the disease is unquestionable.

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† With the coöperation of the City Health Department of Grand Rapids, A. H. Edwards, M.D., Health Officer.

The finding of this organism in cases of whooping cough—from the mildest to the most severe infections—approaches 100 per cent as the technic approaches perfection, and the organism is not found in the absence of this disease. Further, pertussis has been produced by the culture in laboratory animals as evidenced by more recent reports such as those of Sauer and Hambrecht,[4] Rich, Long, Brown, Bliss and Holt,[5] and Shibley,[6] who used special technic to assure the freedom of the culture from a filtrable virus; and experimental pertussis in children has been reported by MacDonald and MacDonald.[7] Added to this are the encouraging reports of some, notably Madsen and coworkers [8] and Sauer [9] on the results of specific vaccines prepared from recently isolated cultures. A summary of various data in favor of the etiologic rôle of *B. pertussis* by Miller [10] gives considerable material relevant to this subject.

On the basis of the accumulated evidence we believe there is no excuse for us to cease our efforts toward whooping cough prevention. Rather, there is good reason for proceeding on the assumption that *B. pertussis* is the cause of whooping cough; and accepting this, the study naturally centers around the organism *B. pertussis*.

THE BACTERIOLOGICAL DIAGNOSIS OF WHOOPING COUGH

Methods—The technic employed in cough plate diagnostic procedure has been outlined in previous communications.[1, 11] The exposure of cough plates has been done almost entirely during the past year by 25 nurses in the Bureau of Public Health Nursing.* This is part of a coöperative plan instituted about a year ago between the Health Department of Grand Rapids and the physicians of the city. Upon the request of a physician the nurse in the particular district secures a diagnostic cough plate, and the laboratory findings are reported to both physician and City Health Department. If the first plate is negative or unsatisfactory and the diagnosis of whooping cough has not been ruled out in the meantime, a second plate is obtained. If either plate is positive or if both are negative and the patient has definite clinical signs of whooping cough, isolation is established and release plates are taken as explained later under the section on release measures.

Between November 1, 1932, when diagnostic cough plate service was instituted on a routine basis and August 1, 1934, 984 plates were examined, not including 40 which have been reported as unsatisfactory for some reason such as insufficient inoculation or overgrowth with contaminants. The results are summarized in Table I.

TABLE I
SUMMARY OF COUGH PLATE EXAMINATIONS

Clinical Diagnosis	Number of Cough Plates		
	Positive	Negative	Total
Whooping cough through 4 weeks	254	160	414
Post-whooping cough 5 wks. to 6 mos. after onset	13	242	255
Other than whooping cough	0	218	218
Clinical data not available	0	97	97
Totals	267	717	984
Unsatisfactory			40

In clinical whooping cough, the correlation of the stage of disease with positive cough plate findings is always of interest and significance. Particularly, such findings give us an indica-

* Under the direction of B. Randle

tion of the probable period of infectivity and therefore of a reasonable isolation period. In Table II are the results of plates from 332 cases of whooping cough.

TABLE II

WHOOPING COUGH CASES: SUMMARY OF PLATES CORRELATED WITH STAGE OF DISEASE

WEEK OF DISEASE	Positive	Negative	Total	% Positive
1	91	25	116	78
2	80	45	125	64
3	58	36	94	62
4	25	54	79	32
5	10	56	66	15
6	1	30	31	3
Totals	265	246	511	

By comparison with our report of a year ago,[1] it will be seen that with the addition of more material, the percentages of positive plates during different weeks of disease have been changed somewhat but the essential picture is the same. The data suggest that a relatively high per cent of patients are infective throughout the first 3 weeks of disease, a progressively smaller per cent continue so through the 4th and 5th weeks, while only an occasional individual remains so after the 5th week.

Comment—The increasing number of physicians taking advantage of the cough plate diagnostic service is an indicator of the assistance bacteriological findings give them. While 22 used the cough plate service during the first year, 70 have received laboratory reports during the second. Many instances attest to the aid these reports have given in establishing the diagnosis of the atypical, light, or second attack of whooping cough, and in obtaining an early diagnosis before the characteristic cough has developed. The experience of these 2 years leaves little room for doubt as to the practicability and value of the bacteriological diagnosis of whooping cough.

BACTERIOLOGICAL FINDINGS AS A BASIS FOR ISOLATION AND RELEASE PROCEDURES

The data on the presence of *B. pertussis* at various stages of the disease (see Table II) suggest that if an arbitrary isolation period were to be chosen at the termination of which over 90 per cent of the patients would be noninfective, it would be 5 weeks. A week earlier than this, an appreciable number would still be infective.

The feasibility of using release cultures in whooping cough has been recognized by certain authors, for example Lawson and Mueller,[12] but we have seen no report of their actual application. For the past year we have been attempting such a test. The relatively low incidence of whooping cough in the city during this time has made possible the extra labor involved in the various divisions of health department and laboratory, though it has limited the quantity of our data. As an indication that the regulations as tested are not considered impossible from the standpoint of administration, they were recently incorporated in the local communicable disease regulations, as follows:

1. Cases and suspected cases shall be reported.
2. Patients shall be isolated on the basis of either clinical or bacteriological diagnosis.
3. A warning placard shall be placed on the home.
4. Patients shall be released 35 days after onset of disease (first symptoms), if the cough plate is not employed.
5. A patient may be released on the 28th day after onset of disease if there have been two consecutive negative cough plates taken at least 24 hours apart, the first one taken not earlier than the 21st day after onset.

If one of the first two release plates is positive, the third plate should not be taken before the 28th day.

6. Every effort shall be made to encourage voluntary isolation of a patient while the first cough plates are being examined or until the clinical diagnosis has been made.

Results of the application of bacteriological release—The findings of actual release plates agree very closely with what might be expected from the accumulated data on the per cent of positives during the various stages of the disease. The results to date are summarized in Table III.

TABLE III
RELEASE COUGH PLATE FINDINGS

Release cough plates		Patients for release		
Week obtained	Number of plates	Total patients	Released	%Released
4th	86	58	33	57
4th and 5th	125	69	63	91
4th, 5th & 6th	155	83	82	99

In starting our study of release procedures, we were not always able to obtain a complete series of plates from each patient, so the 3 periods analyzed —the 4th week; 4th and 5th; and 4th, 5th, and 6th weeks; respectively—are considered as separate units. For instance, if a patient had 1 or more positive plates during the 4th week and hence was not ready for release, but for some reason further plates were not secured, data pertaining to him were included only in the first period.

Our findings show that 33 of 58 patients or nearly 60 per cent were released on the basis of negative cultures taken during the 4th week. Further plates, all negative, were submitted by some of the 33 patients after the 4th week, thus strengthening the basis for their early release. Of the second group—those included during the 4th and 5th weeks—only 6 of 69 individuals, or less than 10 per cent, remained positive at the end of the period. In the cumulative data of the 4th, 5th, and 6th week interval, only 1 of 83 cases had not been released at the end of the 6th week. In general, the application of the cough plate method shortens the isolation period for the majority of cases and lengthens it for a relatively small group.

It is of interest to follow the findings of a series of plates from a few individual cases for release. In Table IV are shown 5 such series. George and Jerry, who are typical of over half the cases, had 2 consecutive negative plates during the 4th week. Allowing 4 days for incubation of the plates before the laboratory report is made, such patients would be released about 28 days after onset. Donald's and Richard's first release plates were positive and it was the end of the 5th week before they could be released. Marvin's case proves the desirability of more than 1 release plate, since his first was negative followed by 2 positives. A requirement of more than 2 negative plates would no doubt add an occasional positive finding

TABLE IV
A FEW TYPICAL FINDINGS IN CASES FOR RELEASE

Patient	Cough plates: results and day of disease		Day of release by laboratory report
	Diagnostic	Release	
George	+ 4	−23−24	28
Jerry	+ 9	−25−26	30
Donald	+ 7	+24−29−30	34
Richard	+ 9	+23+24−30−31	35
Marvin	+14	−27+29+34−35−40	44

but we believe the additional burden not warranted. Further, continued isolation through the 4 day interval between receipt of the plate at the laboratory and the negative report adds a margin of safety.

With the regulations as tested, our findings suggest that in whooping cough, bacteriological release can be made as efficient as in certain other diseases where it is accepted without question. Whether the procedure can or should be applied generally is a question for study under the conditions of different communities.

B. PERTUSSIS VACCINE PREPARATION

If *B. pertussis* is the etiologic agent in pertussis, there is a sound basis for expecting some protection against whooping cough from a suitably prepared, properly administered vaccine. In general, the literature since 1906, when trials of vaccine were begun, does not give convincing support for such protection. An analysis of the different reports, however, shows little basis for comparability of results. Some workers have used vaccine after the onset of disease, some after exposure but before symptoms, a few at a considerable time before exposure, and some at undefined times. The age groups, geography and epidemiology have all supplied variable factors; the dosage has not been sufficiently considered; and adequate controls frequently have been lacking. In the light of more recent knowledge of the antigenicity of cultures and with the encouragement of the more recent results of Madsen and coworkers [8] and of Sauer,[9] there is good reason for a reinvestigation of the value of *B. pertussis* vaccine. The problem is one for a carefully controlled, longtime study, and conclusive evidence must await an analysis of the results obtained by different investigators.

In the meantime, much is to be gained in a definition of conditions under which different investigators are working. It encourages open discussion of the different factors involved which may lead to some general agreement on the essential requirements for technical procedures. It is in this spirit that we briefly outline the methods employed in the preparation of *B. pertussis* vaccine as used in our study—not as the perfect solution of the complex problem. The methods represent to us a starting point for future studies—a line of procedure to be adhered to in its essentials for a sufficient time to give our results meaning and to furnish a sound basis of judgment.

Selection of suitable cultures—The first point is the suitability of the cultures to be used. Lack of conformity among different workers on this point could provide ample explanation for widely divergent results.

If certain profusely growing old laboratory strains of *B. pertussis* were satisfactory, vaccine preparation would be relatively simple. We have reason to question their suitability since we know that they may be serologically quite distinct from cultures just isolated from patients with whooping cough—cultures which, in general, form a homogeneous serological group, "Phase I" of Leslie and Gardner. Madsen [8] and Sauer [9] have recognized this in their specification of "recently isolated" cultures. The date of isolation has been a helpful temporary criterion but it is an inexact and superficial one. Just where shall we draw the line between a "recently isolated" and an "old" culture? Can we be sure in substituting a week-old culture for one 6 months old that we have improved the antigenicity of our vaccine? We agree with Hawley and Simmons [15] in connection with typhoid vaccine, that their practical problem may be more concerned with determining and maintaining the desirable state of their culture than with the search for one recently isolated.

In *B. pertussis* vaccines the essential problem is to determine the antigenically effective state and the means of sustaining it. Above all, we need *adequate criteria* for judging the state of the culture. While the final test is whether the vaccine protects against whooping cough, we must have practical laboratory indicators for accepting or refusing any particular culture for a lot of vaccine. Accepting the thesis that the culture just isolated from a patient with whooping cough is the most likely to be antigenically active in a vaccine, we have studied numbers of such cultures in an effort to arrive at the significant characteristics by which to judge them. In these studies,[16] we have made use particularly of serological relationships, pathogenicity for mice and guinea pigs and the intradermal test in the rabbit. We believe they have demonstrated that certain characteristics are of such uniformity and significance as to furnish reliable guidance in judging the antigenicity of cultures. In the present state of our knowledge we accept the following *criteria for selecting cultures* for a vaccine:

1. *Typical morphology and growth characteristics* including hemolysis on Bordet-Gengou medium. These are described by various authors, including ourselves.[1]

2. *Agglutination to high titer* by smooth strain anti-serum (Phase I, Leslie and Gardner). For agglutination tests we use the rapid method previously described.[11]

3. *Phase I agglutinin production* in the rabbit. The rabbit is injected intravenously at 3 day intervals with 0.2, 0.4 and 0.8 c.c. per kg. weight, successively, of a 10 billion per c.c. saline suspension of organisms killed with a preservative such as merthiolate 1:10,000, or phenol 0.5 per cent. A bleeding on the 6th or 7th day after the 3rd dose is usually from 1:2,000 to 1:5,000 final titer, rapid test (1:10,000 to 1:25,000, equivalent titer) with any Phase I culture.

4. Typical *rabbit skin reaction* of hemorrhagic necrosis. A dose of 0.1 c.c. of a 1 billion per c.c. living, saline suspension of a Phase I culture gives a characteristic reaction. Typically, within a few hours there is an ischemic, indurated area at the site of inoculation. By 24 hours there is a purplish hemorrhagic center which progresses to necrosis, scab formation and final scarring. This reaction has been recognized by several workers and recently described by Gundel and Schlüter.[20] Its value in studying *B. pertussis* cultures was discussed in a previous paper.[16]

While developing these criteria, we have also given attention to the date of isolation. In general, we have used 6 cultures for each lot—all isolated within 3 months and 3 of them within 1 month. We believe this age factor is unimportant, provided the cultures have the characteristics described. Further, we are not convinced that several cultures are superior to one, properly chosen, but we continue to employ several while this point is under study.

Choice of technical methods—Having decided upon the cultures, we are confronted with the necessity of choosing technical procedures. Our objective should be to grow the cultures in such a way as to maintain their *antigenicity;* to determine the conditions of *maximum growth* consistent with maintenance of the antigenic state; to kill and preserve them *without denaturing* the active antigens; and, finally to provide a *safe* product. In choosing particular technic, we have been guided by practicability in so far as it did not conflict with these essential requirements.

We have found that cultures maintain their Phase I characteristics on the Bordet-Gengou medium used for cough plate,[1] so have used this medium in growing cultures for vaccines. We are trying out a similar medium with added veal infusion and peptone, in line with that used in Copenhagen and described by Miller.[14] This supports a heavier growth, and our adoption of it awaits only further tests of the antigenicity of the cultures.

The *kind of blood* to use in the medium has been emphasized by Sauer[17] in his insistence upon human blood. As to the maintenance of Phase I antigenic properties, we have found

no difference between human and sheep's blood. As to the safety factor, there are no convincing theoretical grounds, and in our experience with the inoculation of several hundred children, there is no experimental basis for any fear in this regard. Since we have found human and sheep's blood equally satisfactory, we use sheep's blood as it provides a far more uniform, constant, and less limited supply than is available from human sources. In the meantime, this point is under continued study.

We need to know the *optimum state* with respect to antigenicity in which to administer the vaccine. Most vaccines have been suspensions of whole organisms. Kreuger, Nichols and Frawley [18] recently described a water-clear pertussis antigen prepared by grinding washed cultures in a ball mill for 12 hours and subsequent filtration through a collodion membrane. We shall watch the use of this with great interest. As for our own studies, our first aim is to satisfy ourselves in a carefully controlled series of injections, as to the results of the *whole culture vaccine*. If definite protective value can be established for such vaccines by different investigators, and the conditions of their success defined, there will be a sound basis for the judgment of modified and improved antigens.

The question of *washing the suspension* arises. We have to choose between an unwashed product which carries with it agar, blood and other medium derivatives and a washed vaccine relatively free from them. A washed product surely is preferable if significant antigenic properties are not lost. Since we have found the washed live culture capable of giving a typical skin reaction and a vaccine, even after 3 washings, capable of stimulating Phase I agglutinins rapidly and in high titers, we decided on a *washed product*. The growth is washed off the medium into physiological salt solution, its turbidity adjusted roughly to approximately 10 billion organisms per c.c. by comparison with known suspensions, and the organisms washed once by centrifugation and the supernatant fluid discarded. The sediment is resuspended in saline and filtered through cotton.[11]

As to the killing and preserving of the vaccine in such a manner as to leave the active antigens unimpaired, there is need for further study—in this as in other vaccines. We have avoided the use of heat and have killed the cultures by chemicals. We have used merthiolate 1:10,000 and in some lots phenol 0.5 per cent. In either case we obtain a vaccine which is effective in stimulating Phase I agglutinin production in the rabbit.

The method of *standardization of the density of suspension* is another point for consideration. Our first counts by Wright's method showed a great variation. We made an extended series of counts by this method and in different types of chambers in comparison with the determination of per cent of suspension by the Hopkins tube, and concluded that the Hopkins method gives far more uniform results and that it is an immeasurably more simple method of standardization. Our comparative tests indicate that a 0.3 per cent suspension by this method represents approximately 10 billion organisms per c.c. The suspension to be tested is adjusted roughly by turbidity to slightly heavier than that required, a volume of 5 c.c. is centrifugated at 2,500 r.p.m. in a Hopkins tube for 30 minutes, estimations made from the measured sediment and the suspension adjusted to 0.3 per cent.

In brief, our vaccine is a once-washed, 0.3 per cent suspension of Phase I *B. pertussis* grown on Bordet-Gengou medium enriched with 15–20 per cent sheep's blood. The organisms are killed

with a preservative such as merthiolate 1:10,000 or phenol 0.5 per cent allowed to act at cold room temperature for a week or more. The product is tested for purity and sterility by the usual procedures of staining, aerobic and anaerobic broth cultures and Bordet-Gengou medium cultures; for safety by guinea pig tests; and for antigenicity as indicated by agglutinability with Phase I serum and by ability to produce Phase I agglutinins in the rabbit rapidly and in high titer.

COMMENT

As public health workers, we need to realize the seriousness of whooping cough as a communicable disease of childhood. The important place it holds as to cause of mortality, morbidity and pathological sequelae is emphasized in a recent report of the League of Nations Health Committee.[21] It is pointed out in this report that the death rates from whooping cough and measles have declined more slowly during the past 30 years than have those from diphtheria and scarlet fever, and consequently their relative importance as a cause of death has increased. During 1926–1930, in 6 countries including the United States, whooping cough was responsible for about one-third of the total deaths from diphtheria, scarlet fever, whooping cough, and measles. In the period 1927–1929, the same proportion held true in the United States for the total deaths, while in the age group 0–4 years, whooping cough was responsible for 43.5 per cent of all deaths from these 4 diseases; diphtheria, 30.6 per cent; measles, 19.1 per cent; and scarlet fever, 6.6 per cent.

The need for a study of whooping cough control measures is obvious. While the problem is a complex one, we should not avoid it as being impossible of solution. A note of hope is struck in an editorial of the *British Medical Journal*[19]:

> A survey of all this recent work leaves us with hope that this plague of the nursery and school, which in 1932 caused 300,000 infections in the United States and upwards of 6,000 deaths, will in time be as controllable as diphtheria now is to those who choose to benefit by methods at our command.

We believe that bacteriological methods as discussed in this paper offer reasonable promise of aid and deserve a thorough trial under conditions as favorable to their success as we can make them. The more widespread their use, the more centers there will be for studying various phases of the whole problem—for it is only in such centers that there is the necessary background for a comprehensive study of the subject.

SUMMARY

We have summarized the results of nearly 2 years' routine laboratory examinations for *B. pertussis* and have pointed out their application to the diagnosis of early, light and atypical whooping cough; to isolation and release procedures; and to the study of specific methods for whooping cough prevention.

Whooping cough isolation and release procedures which have crystallized out of our bacteriological study are now under test as a part of Grand Rapids Health Department communicable disease regulations.

Criteria for the selection of cultures and for the choice of technic employed in preparing vaccines for whooping cough prevention studies have been discussed.

REFERENCES

1. Kendrick, Pearl, and Eldering, Grace. Cough plate examinations for B. pertussis. *A.J.P.H.*, 24: 309 (Apr.), 1934.

2. McCordock, H. A., and Muckenfuss, R. S. The similarity of virus pneumonia in animals to epidemic influenza and interstitial bronchopneumonia in man. *Am. J. Path.*, 9:221, 1933.

See also "Whooping Cough," Report of the Referee, Pearl Kendrick, p. 155, Year Book (Supplement).

3. McCordock, H. A., and Smith, M. G. Intranuclear inclusions. *Am. J. Dis. Child.*, 47:771–779 (Apr.), 1934.
4. Sauer, L. W., and Hambrecht, L. Experimental whooping cough. *Am. J. Dis. Child.*, 37:732, 1929.
5. Rich, A., Long, P., Brown, J. H., Bliss, E., and Holt, L. E. Experiments upon the cause of whooping cough. *Science*, 76:330 (Oct. 8), 1932.
6. Shibley, G. S. Etiology of whooping cough. *Proc. Soc. Exper. Biol & Med.*, 31:576 (Feb.), 1934.
7. MacDonald, H., and MacDonald, E. J. Experimental pertussis. *J. Infect. Dis.*, 53:328 (Nov.-Dec.), 1933.
8. Madsen, T. Vaccination against whooping cough. *J.A.M.A.*, 101:187 (July 15), 1933.
9. Sauer, L. Whooping cough: A study in immunization. *J.A.M.A.*, 100:239 (Jan. 28), 1933.
10. Miller, J. J. Etiology of whooping cough. *J.A.M.A.*, 100:681 (Mar. 4), 1933.
11. Kendrick, P. Rapid agglutination technic applied to B. pertussis. *A.J.P.H.*, 23:1310 (Dec.), 1933.
12. Lawson, G. M., and Mueller, M. The bacteriology of whooping cough. *J.A.M.A.*, 89:275, 1927.
13. Leslie, P. H., and Gardner, A. D. The phases of *Haemophilus* pertussis. *J. Hyg.*, 31:423 (July), 1931.
14. Miller, J. J. Experimental observations on the antigenic potency of H. pertussis extracts. *J. Immunol.*, 26:247 (Apr.), 1934.
15. Hawley, P. R., and Simmons, J. S. The effectiveness of vaccines used for the prevention of typhoid fever in the United States Army and Navy. *A.J.P.H.*, 24:689 (July), 1934.
16. Kendrick, P., and Eldering, G. A Study of B. pertussis cultures by means of animal inoculation. *J. Bact.*, 27:97, 1934 (abstract).
17. Sauer, L. The preparation of Bacillus pertussis vaccine for immunization. *J.A.M.A.*, 102: 1471 (May 5), 1934.
18. Kreuger, A. P., Nichols, V. C., and Frawley, J. M. Preparation of an active undenatured antigen from *Hemophilus* pertussis. *Proc. Soc. Exper. Biol. & Med.*, 30:1097, 1933.
19. Editorial, *Brit. M. J.*, 3807:1177 (Dec. 23), 1933.
20. Gundel, M., and Schlüter, W. Experimentelle Untersuchungen über den Keuchhusten bazillus (Bacillus Bordet-Gengou), seine Diagnose und die Differentialdiagnose gegenüber Influenza-bazillen. *Centralbl. f. Bakteriol.*, Orig., 129:461, 1933.
21. Article. Relative importance of the principal infectious diseases of childhood (diphtheria, scarlet fever, whooping cough and measles.) *Epidem. Ref., Health Com., League of Nations*, R. E. 173: (May–June), 1934.

Weight of Children

1. Averages of weight of children in 1934 show no consistent or striking differences from averages of weight for the period 1921 through 1927.

2. The variability of body weight (measured by the standard deviation) is not, for boys, consistently different in 1933 and 1934 from that observed in the 1921–1927 period. For girls, weight is more variable in both 1933 and 1934 than in the earlier period.

3. The proportion of boys 12 per cent or more below average weight has not increased in 1933 or 1934, while the proportion of girls so designated is slightly greater, both in 1933 and in 1934, than that observed for the years 1921–1927.

4. Average annual gains in weight are lower for the year 1933–1934 than those calculated for the 1921–1927 period. The average for the several age-sex groups, of the ratio

$$\frac{\text{Average annual gains in weight, 1933–1934}}{\text{Average annual gains in weight, 1921–1927}}$$

equals 91.5 per cent. Comparing this ratio with similar average ratios for the separate years 1921–1927 shows, however, that the relative gain for 1933–1934 is not significantly lower than that recorded in 1924–1925, a year in which general economic conditions were presumably much better than in 1933–1934. This finding, together with the fact that the actual weight of children has not decreased in the past decade, is taken as evidence that the recent economic depression has not materially affected the growth in weight of a representative sample of school children.

5. A supplementary study of the weights and weight increments of children from families in different levels of economic status in 1933 and 1934 shows that approximately the same differences are to be found as have been observed in times previous to the depression. From this it is concluded that there has been no obliteration or widening of class differences during the depression.—

Carroll E. Palmer, M.D., Further Studies on Growth and the Economic Depression, *Pub. Health Rep.*, Dec. 7, 1934, pp. 1468–1469.

Some Factors in the Epidemiology of Malaria*

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THE factors concerned in the epidemiology of malaria are so numerous that it is difficult to choose the one appropriate to the opening of a discussion of this nature.

Owing to limited time the usual historical references must be left out and those interested in malaria history are referred to a voluminous literature on the subject. The geographical distribution of malaria covers a belt around the world wider than the tropics, extending irregularly into the temperate zones on both sides of the equator. In the north it is found to extend to points varying from 45° N. L. to 60° N. L. in the old world, and in the new world as far north as 40° to 42° N. L. To the south it covers nearly all South America with severe manifestations in the northern portion, along the Magdelena, Orinoco, and Amazon Rivers, and in the Guianas.

It is not practical to discuss the epidemiology of malaria on a world-wide basis, because such an effort would require volumes and more time than is allotted to the entire program of the Association.

Factors influencing epidemiology are:

1. Presence of persons with parasites in the blood
2. Presence of Anopheles of a species effective as a carrier
3. Accessibility of human parasite carrier to Anopheles
4. The presence of gametocytes in the blood of the parasite carrier
5. The age of the sporozoites, *i.e.*, the length of time the mosquito has carried the infective agent. Boyd has found that infectivity is reduced with the age of the infected mosquito
6. Immunity to prevailing strains:

A. Latent infection. In the malaria research division of the State Board of Health, Boyd and Stratman-Thomas found it difficult to reinfect with the same strain individuals who had recovered spontaneously from an attack produced by that strain. The protective mechanism is thought to be associated with a continuing residuum of the infecting strain, which is spoken of as latent infection.

B. Racial tolerance to certain species of the parasite. For example, the negro is apparently highly resistant to *Plasmodium vivax* (benign tertian) but susceptible to *P. falciparum*. Boyd has found it very difficult to infect negroes with *P. vivax*, in fact, in some cases adult negro males "have been found with a tolerance that successfully resists the application of 16 *Anophelines* of proven infectivity." The refractoriness is believed to be racial and not acquired. (*33rd Report Florida State Board of Health, page* 76.)

7. The prevailing external temperature controls the length of time required for the development of the parasite in the mosquito, *e.g.*, at 20° C. (68° F.) 17 days is required to complete the sporogenous cycle in the mosquito (extrinsic incubation). Tempera-

* Read before the Epidemiology Section of the American Public Health Association at the Sixty-third Annual Meeting in Pasadena, Calif., September 3, 1934.

ture and humidity also play an important part in the longevity of the mosquito, and, seasonally, the period of mosquito activity, hence the importance of relatively high winter temperatures in Florida.

The intrinsic incubation of tertian malaria varies from 10 to 20 days—longer periods are exceptions. Eighty-five and 97 days are said to have been observed. The parasite (*P. vivax*) is often found some days before the manifestation of clinical symptoms, sometimes 6 days before onset, a fact which may or may not influence the epidemiology (Boyd).

Gametocyte production is more constant and abundant in primary attacks of tertian than in recurrences. Consequently, mosquitoes feeding on a patient in the primary attack may develop more cysts and sporozoites than those feeding on patients in secondary attacks with a lower gametocyte production.

In *P. falciparum* (E.A.) the extrinsic incubation is 23 days at 20° C. according to Florida findings; the intrinsic is 8–15 days. Both the white and Negro races show a high degree of susceptibility to quartan.* Extrinsic incubation is 35 days. Intrinsic incubation is 27 to 42 days. Quartan malaria is more severe than tertian and more exhausting, but comparatively rare in the state.

In this paper we are dealing with factors in the epidemiology of malaria chiefly as we see it in Florida. Conditions which prevail in Northern Florida are very much like, if not identical with, those in Southern Georgia and Alabama.

1. The geographic distribution as represented by deaths reported to the Bureau of Vital Statistics of Florida has been the basis on which incidence is computed and is shown in Tables I and II for the years 1932 and 1933. In comparing the two tables it is noted that there was a decided increase in the number of deaths reported in 1933 as compared with 1932 (373 vs. 233).

The greatest concentration of cases occurs in the northern counties, the central group, opposite the southwestern portion of Georgia and southeastern

* In experimental work or malaria therapy.

FIGURE I

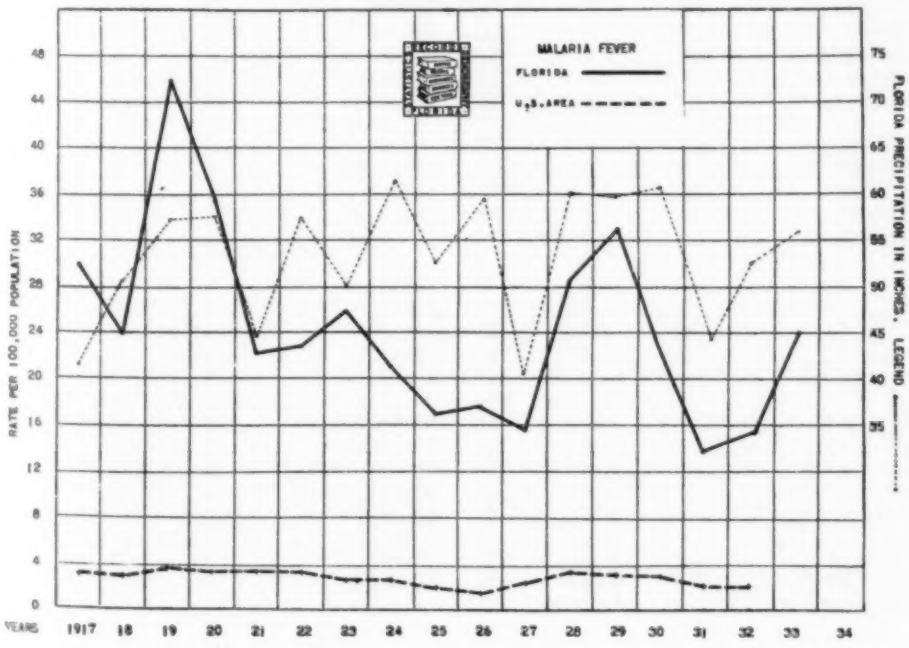
MALARIA FEVER
FLORIDA
U.S. AREA
RATE PER 100,000 POPULATION
FLORIDA PRECIPITATION IN INCHES. LEGEND
YEARS
1917 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34

TABLE I

DEATHS FROM MALARIA, BY COLOR, BY MONTHS, AND BY COUNTIES, FLORIDA, 1932

Central Bureau of Vital Statistics, Florida

Counties	*Total*	*W*	*C*
State	233	123	110
Alachua	7	4	3
Baker	0	0	0
Bay	5	5	0
Bradford	1	0	1
Brevard	0	0	0
Broward	2	1	1
Calhoun	7	6	1
Charlotte	2	1	1
Citrus	3	0	3
Clay	2	1	1
Collier	0	0	0
Columbia	10	7	3
Dade	2	2	0
DeSoto	2	2	0
Dixie	5	2	3
Duval	2	0	2
Escambia	5	1	4
Flagler	0	0	0
Franklin	2	1	1
Gadsden *	18	7	11
Gilchrist	3	3	0
Glades	0	0	0
Gulf	0	0	0
Hamilton	0	0	0
Hardee	1	1	0
Hendry	0	0	0
Hernando	3	2	1
Highlands	1	0	1
Hillsboro	4	2	2
Holmes	4	4	0
Indian R.	0	0	0
Jackson	14	7	7
Jefferson	10	2	8
Lafayette	2	1	1
Lake	1	1	0
Lee	1	0	1
Leon	10	7	3
Levy	5	4	1
Liberty	2	2	0
Madison	7	1	6
Manatee	8	5	3
Marion	13	4	9
Martin	1	0	1
Monroe	0	0	0
Nassau	1	0	1
Okaloosa	3	3	0
Okeechobee	0	0	0

TABLE II

DEATHS FROM MALARIA, BY COLOR, BY MONTHS, AND BY COUNTIES, FLORIDA, 1933

Central Bureau of Vital Statistics, Florida

Counties	*Total*	*W*	*C*
State	373	207	166
Alachua	11	9	2
Baker	0	0	0
Bay	5	3	2
Bradford	2	2	0
Brevard	0	0	0
Broward	3	2	1
Calhoun	5	4	1
Charlotte	1	1	0
Citrus	4	1	3
Clay	1	0	1
Collier	0	0	0
Columbia	10	8	2
Dade	1	1	0
DeSoto	2	2	0
Dixie	1	1	0
Duval	12	10	2
Escambia	4	3	1
Flagler	1	1	0
Franklin	9	4	5
Gadsden *	16	4	12
Gilchrist	7	7	0
Glades	0	0	0
Gulf	0	0	0
Hamilton	8	4	4
Hardee	5	5	0
Hendry	0	0	0
Hernando	2	1	1
Highlands	0	0	0
Hillsboro	15	12	3
Holmes	8	8	0
Indian R.	0	0	0
Jackson	21	8	13
Jefferson	26	10	16
Lafayette	3	2	1
Lake	3	0	3
Lee	2	0	2
Leon	19	10	9
Levy	10	5	5
Liberty	2	2	0
Madison	20	7	13
Manatee	3	1	2
Marion	28	14	14
Martin	1	0	1
Monroe	0	0	0
Nassau	4	1	3
Okaloosa	0	0	0
Okeechobee	0	0	0

TABLE I

DEATHS FROM MALARIA, BY COLOR, BY MONTHS, AND BY COUNTIES, FLORIDA, 1932

Central Bureau of Vital Statistics, Florida

Counties	*Total*	*W*	*C*
Orange	5	2	3
Osceola	1	0	1
Palm Beach	2	1	1
Pasco	3	2	1
Pinellas	6	1	5
Polk	8	8	0
Putnam	1	1	0
St. Johns	3	2	1
St. Lucie	0	0	0
Santa Rosa	0	0	0
Sarasota	1	0	1
Seminole	3	0	3
Sumter	2	1	1
Suwannee	3	2	1
Taylor	4	3	1
Union	2	1	1
Volusia	5	2	3
Wakulla	8	5	3
Walton	5	2	3
Washington	2	1	1

Months, 1932	*Total*	*W*	*C*
January	12	6	6
February	11	7	4
March	11	4	7
April	19	8	11
May	8	2	6
June	17	9	8
July	22	14	8
August	20	10	10
September	28	11	17
October	30	20	10
November	35	20	15
December	20	12	8

* State Hospital inmates included

TABLE II

DEATHS FROM MALARIA, BY COLOR, BY MONTHS, AND BY COUNTIES, FLORIDA, 1933

Central Bureau of Vital Statistics, Florida

Counties	*Total*	*W*	*C*
Orange	0	0	0
Osceola	1	1	0
Palm Beach	5	4	1
Pasco	1	0	1
Pinellas	6	5	1
Polk	13	9	4
Putnam	12	8	4
St. Johns	1	0	1
St. Lucie	0	0	0
Santa Rosa	1	1	0
Sarasota	3	2	1
Seminole	7	1	6
Sumter	6	2	4
Suwannee	15	6	9
Taylor	7	6	1
Union	2	2	0
Volusia	9	3	6
Wakulla	2	1	1
Walton	4	2	2
Washington	3	1	2

Months, 1933	*Total*	*W*	*C*
January	9	6	3
February	9	3	6
March	11	3	8
April	9	6	3
May	13	8	5
June	19	11	8
July	42	20	22
August	59	33	26
September	65	37	28
October	56	32	24
November	55	33	22
December	26	15	11

* State Hospital inmates included

Alabama and south through the central portion of the state as far as Polk County beyond which the incidence becomes much less significant.

In a country within the latitude of high malaria incidence there is a tendency to call all ill-defined fevers malaria, rendering difficult an accurate determination of morbidity, which can only be ascertained by spleen and blood smear surveys. In order to judge how nearly our vital statistics represented the epidemicity or endemicity of malaria in the state, a spleen index of school children was taken in 1931 by Boyd and Stratman-Thomas in the 14 counties lying between the Apalachicola and Suwannee Rivers (*Thirty-third Annual Report—A Decade in Public Health*, Florida State Board of Health). Of those examined, the spleen index was 15.2 per cent among 2,502 Negroes,

and 34.2 per cent for 3,009 whites, or an average for both races of 25.6 per cent.

The area involved geologically is underlaid by limestone, and has numerous depressions forming sinks, lakes, and ponds of various sizes, the edges of which, and frequently much of the surface, are favorable to Anopheles breeding.

Further reference to the tables shows a greater mortality in certain counties such as Jefferson, Madison, Suwannee, Jackson, Leon, etc. The incidence is mainly rural. The urban rate is very low, although the disease is frequently contracted by persons who have been away from the cities at night.

2. Annual fluctuations are shown in Figure I, in which there is an apparent peak every 10 years with secondary intermediate peaks. Meteorological records show corresponding peaks in the spring and summer rainfall. The precipitation in the years 1924–1925 and early in 1926 was largely winter rain (see Boyd charts).

Aside from the rainfall and mosquito production it has been suggested that the fluctuation in incidence bears a relation to immunity acquired by a considerable portion of the population during the peak years.

Boyd has shown that persons who show clinical recovery from the acute attack without specific treatment were not susceptible to reinfection by the same strain of the parasite, and there is some indication of tolerance to a heterologous strain. How long this tolerance lasts is not known.

3. Anopheles of the state are: *A. quadrimaculatus, A. crucians*—two varieties (fresh and salt water), *A. punctipennis, A. atropos, A. walkeri, A. barberi.*

While the 6 foregoing species are all potential vectors, *quadrimaculatus* is by far the most important. This species is found over the state extending as far south as Collier and Broward Counties and the northern third of Dade County, with greatly lessened production along the coasts. Anophelines of any species have not been found in numbers sufficient to be of sanitary importance, south of the east and west portion of the Tamiami Trail.

The distribution of species has an important bearing on epidemiology. The malaria incidence in our state coincides with the *A. quadrimaculatus* production, which is most accurately determined by the search for and the finding of adults. Observations on breeding made by dipping for larvae will not furnish the necessary knowledge concerning emergence of imagoes.

In so far as the Florida problem is concerned, the findings of Boyd in his work on the rearing of Anopheles (*quadrimaculatus, crucians,* etc.) in which he has found *quadrimaculatus* easily infectable with *P. vivax,* and *P. falciparum* together with the fact that *quadrimaculatus* is a known pond and lake breeder, lead us to believe that *quadrimaculatus* emergence is the main factor.

4. So far as the relative importance of the different species is concerned, *quadrimaculatus* is responsible for most of the malaria in the state. Other species, such as *crucians, punctipennis,* and *atropos,* are proven carriers but are regarded as epidemiologically unimportant. A factor of great importance is the habit, or tendency of *quadrimaculatus* to invade dwellings and sleeping quarters. Areas with heavy *crucians* production show relatively low case incidence of malaria, as determined by blood indices taken by Griffitts. For example, Bradford County at the time of the survey showed fairly heavy *crucians* production and infestation, but only 1.9 per cent of 1,643 school children were blood positive. Of those positive 37.5 per cent were E.A. (*P. falciparum*), 18.8 per cent benign

tertian, and 3.1 per cent were mixed infection. Of 6,161 school children examined during 1933, outside of the main endemic area, 5.4 per cent showed parasites on microscopic examination, a finding which seems to harmonize with the mortality statistics for the same area.

Leon County lying within the main endemic area, and having relatively high reported mortality, showed a blood smear index of 9.5 per cent among 655 children of which 87.1 per cent were *P. falciparum* (E.A.) and 4.9 per cent *P. vivax* (B.T.) and 1.6 per cent mixed, with 4.6 per cent species undetermined. Of the 9 schools examined the rate varied from 6.6 per cent to 41.7 per cent.

In Levy County 39 schools were examined, in 7 of which no positives were found, the remaining 32 varying between 2.7 per cent and 84.2 per cent. In the school showing 84.2 per cent positive, 81.2 per cent were E.A. infectious and 12.5 per cent B.T., while in 6.3 per cent the species were not determined.

During the past 2 years (1932–1934) 15,257 school children (mostly rural) have been examined (thick blood films) for malaria infection. This survey included the primary grades of 294 white and Negro schools in 16 counties in the northern section of the state. The rate of infection was found to be 6.1 per cent with 70.1 per cent *P. falciparum*, 21.7 per cent *P. vivax*, 0.2 per cent *P. malaria*, 1.7 per cent mixed *P. falciparum* and *P. vivax*, and 6.3 undetermined. As expected, the area of reported high mortality corresponds with a relatively high P. *falciparum* rate.

Fluctuations in precipitation, periods of drought followed by heavy rain, are followed by a somewhat corresponding fall and rise in the malaria morbidity and mortality curves (see Figure I).

The foregoing discussion has dealt briefly with a few of the biological and climatological principles which influence the appearance and continuation of malaria in a section of the southeastern United States, without reference to the influence of sanitary engineering or medical control measures.

Measles Epidemic Broke Record

MEASLES has broken a 21 year record. The number of cases reported each week has been higher than at any time since the U. S. Public Health Service began keeping records of this disease in 1912.

The epidemic has just begun to abate, less than 30,000 cases being reported weekly now. At the peak of the epidemic, during the first week in April, 35,000 were reported by state health officials to the U. S. Public Health Service in Washington, D.C.—*Colorado Medicine* 31, 11:379 (Nov.), 1934.

A Study of Diphtheria Immunization in Preschool Children in Assumption Parish, La., 5 Year Period 1929-1933

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THE population of Assumption Parish is 15,990, and, according to the White House Conference reports, the preschool population of an average American city is 13 per cent of the population as a whole. Of course it is considered that the rural population is somewhat more prolific than the urban, therefore there should be a slightly larger percentage of preschool children in a rural community than in the city. On the other hand, I believe the infant mortality is somewhat greater in rural than urban populations, so there is after all not a great difference in the preschool population of the city and the country as a whole.

In looking over our birth records for the above period we find there have been 2,101 births in the 5 years, 1929–1933 inclusive, or an average of 420 births per year. Now, it will be seen that 13 per cent of 15,990 is 2,078 or very close to the average for city people, a little the rise of it in fact, 2,101, or 13.13 per cent.

Population	*Estimated Preschool Population*
15,990	13.13% of 15,990 equals 2,101

This tabulation shows that we are getting a very accurate birth reporting as the figures tally very closely with the statistical data on which the White House Conference report was founded.

A study of the diphtheria case incidence shows the number of deaths occurring from that disease and the number of diphtheria immunizations completed in the parish since 1929.

Cases of Diphtheria, 1929–1933 inclusive

1929—4 cases, ages: 10 years (1), 6 yrs. (1), 3 yrs. (1), 1½ yr. (1).
Deaths, none.

1930—5 cases, ages: 9 years (1), 6 yrs. (1), 5 yrs. (2), 8 months (1).
Deaths, none.

1931—7 cases, ages: 8 years (2), 7 yrs. (1), 4 yrs. (2), 2 yrs. (2).
Deaths, 1, age under two years.

1932—5 cases, ages: 7 years (1), 6 yrs. (1), 4 yrs. (2), 26 yrs. adult (1).
Deaths, 1, age six years.

1933—2 cases, ages: 3 years (1), 2 yrs. (1).
Deaths, none.

We will pass over the immunization of some 4,000 or more school children in the parish before we were able to induce parents to permit us to immunize the younger children, from 6 months to 6 years, in which latter group diphtheria is most prevalent and most fatal.

In the entire period, 1929, 1930, 1931 we immunized but 117 children under 6 years of age, but as there occurred 7 cases of diphtheria in 1931, 5 of them under 5 years of age, with 1 death, a child of 1 year and 3 months, we determined to make a house to house canvass for preschool children, and the result was such as to stimulate us to

further effort in 1932. In 1932 we gave 601 children under 6 years of age two doses of toxoid and as there were no reactions of consequence it helped to induce parents to have their preschool children immunized, and the year 1933 showed a net 1,036 children under 6 years having had either the one dose, alum precipitated or the two dose toxoid.

From the foregoing it will be seen that up to the end of 1933 we had a total of 1,754 children under 6 years of age immunized against diphtheria, and the summer vacation (1934) will be devoted largely to a further round up of these children under 6 years, to the end that by January 1, 1935, we hope to have no less than 95 per cent, or more of the preschool children immunized. Every physician in the parish will be asked to coöperate in this work, and when one studies the matter closely it will be seen that after all, if the physicians immunized every child born in the parish, year by year, and that if they received $1 per immunization for their fee, it would, after dividing the entire amount equally among the 9 physicians, give each but approximately $40 per year, or if only half of them, which is more likely, were immunized it would be but about $20 per year.

Diphtheria can, should, and must be prevented. I hold that each and every family physician should urge upon each parent at the time of the birth of a baby that the child should be immunized against both diphtheria and smallpox by the time the child is 1 year old, and that if the physician prefers to do it himself rather than delegate the matter to the health department that in a large majority of the cases the family will do as he says and pay the small fee required. Certainly, the immunization should be done, especially when we know that in these little ones is where the greatest danger lies.

With the narration of an interesting incident which occurred in one of the cases of 1932, a death in a child 6 years old, we will bring this study to a close. It is as follows:

A child 6 years old was brought to one of the typhoid clinics and was given typhoid vaccine along with the parents. At a subsequent visit to the typhoid clinic another child, a baby about 1½ years old was brought but instead of giving this baby the typhoid vaccine we advised that they let us give it the diphtheria toxoid (two doses) which was done. The 6 year old was not given toxoid at the time on account of the typhoid vaccine.

A few months slipped away and the little 6 year old who had not been given the toxoid was taken sick and the family doctor suspected diphtheria and so advised us, asking if she had had toxoid, the mother stating that she had been given some "shots." On looking up her record it was found that she had not been given the toxoid, and a smear that had been sent to the Laboratory was reported "positive for diphtheria." She was given antitoxin, 20,000 units, but died within 24 hours from that time.

Meanwhile, the baby that had been given two doses of toxoid a few months before had been sleeping with the child who now had developed diphtheria, but no sign of the disease appeared in the little one, smears from its throat being negative, and while it had had every opportunity to develop the disease it was not in the slightest degree affected.

Of course, one case is not enough on which to base a conclusion that the child was protected by its two doses of toxoid, yet it is well worth relating and we are sorry indeed that we did not give the little 6 year old toxoid instead of the typhoid immunization.

Later. As of November 1, 1934, a total of 614 preschool children have been added to the above, all of them receiving one dose, alum precipitated toxoid, making 833 preschool children having had the one dose since last November, 1933. We are very glad to say that no reaction of any consequence has been heard of, no marked symptoms of any kind have been reported. Of these 614, a total of 530 are under 2 years, and 197 are under 1 year.

There is a signed statement by every

physician in the parish endorsing "the system of universal vaccination against infectious diseases as in effect at the present by our Local Health Unit."

I also represented my parish at the annual meeting of the State Medical Society. This I tell you to show the manner in which I coöperate with the physicians of the parish. Only 1 case this year and no death.

Oregon to Systematize Health and Welfare

CREATION of a State Department of Public Welfare is recommended in the Report of the Governor's Interim Commission on Health and Welfare which has just been completed and is ready for free distribution. In the new Department would be placed all welfare activities while those relating to public health would be consolidated under the State Board of Health. The Commission recommends that this Board be provided sufficient funds fully to protect the citizens of Oregon.

The Public Welfare Department would have supervision over such matters as child welfare, institutional care, paroles and probations. The Oregon State Board of Public Welfare would consist of seven members, appointed by the Governor. One member would be from the faculty of the School of Social Work of the University of Oregon, and the State Medical Society and the State Bar Association would each recommend one. One term would end each year.

The Commission found that all divisions of the State Board of Health are undermanned, and that with the present financial provision it is impossible to carry on the work adequately. The increased demands for prevention of communicable disease requires the employment of an epidemiologist. Though much overworked, the staffs of the Hygienic Laboratory and the Sanitary Engineering Division have not been able to keep pace with their growing tasks. If the required funds are furnished, it was pointed out, not only could the State Board of Health keep up with this work, but it could also do some intelligent planning to improve sanitary conditions in Oregon.

Recommendations included: That the State Board of Health license hospitals, maternity homes, public health laboratories, food handling establishments, shellfish production, overnight staying places and the industrial camps; fees to be large enough to cover adequate inspection. That venereal disease laws be revised, as the present statutes, besides being unenforceable, do not authorize examination for suspicious cases. The laboratory would be asked to establish free darkfield examination and blood tests for all persons unable to pay, regardless of whether they are indigent. That milk sanitation be transferred to the Health Department, which should coöperate with the State Milk Control Board in setting up and maintaining safeguards.

The Commission failed to reach an agreement on proposed consolidation of the healing arts professions and the personal service group, but suggested that, inasmuch as most of the regulations concern educational qualifications, the Department of Education should have supervision if there is a consolidation. It was added that sanitation should be supervised by the Board of Health, which should pass on all proposed sanitary rules and regulations.—*Weekly Bulletin,* Oregon State Board of Health, Portland, Ore., Dec. 25, 1934.

Control of the Processing of Canned Foods in California*

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EXPERIENCE has shown that to preserve foods successfully by canning, all cans should be closed and processed under such conditions that in commercial shipment the ends will retain a concave position under every condition of temperature and altitude that is met. This involves canning the food cold and "exhausting" (heating the food before the container is hermetically sealed), canning the food hot ("precooking") and closing with or without an exhaust, or sealing with mechanical vacuum. To meet the above conditions also implies that the heat treatment given the product after the container is completely and permanently sealed ("process") should be sufficient to prevent the canned food undergoing any change on storage due to the growth of microörganisms surviving the process.

The soundness of canned foods does not necessarily indicate that the product is sterile, *i.e.*, completely devoid of viable organisms. To denote this in contrast to absolute sterility the qualified term "commercially sterile" is generally used by the canning industry. The presence of viable organisms in canned food is not considered significant if their environment is such as to inhibit their growth and multiplication. The question is not whether viable organisms are present in the product, but rather is the food wholesome and merchantable?

To require that all canned foods should undergo no change due to microbial activity under any possible commercial storage conditions may be too rigid for general application, since spores of the group known as thermophiles (having an optimum temperature for growth above 100° F.) are generally much more resistant to heat than those of the mesophilic group such as *Cl. botulinum*. In fact, the resistance of many of the thermophilic group is so great that if even a few spores are present in a can it is often difficult to destroy them without rendering the product unmerchantable. In certain products susceptible to this type of spoilage, storage at temperatures above 100° F. for any length of time sometimes results in the development of a small proportion of swelled cans and/or flat sours, but this is not considered significant from a health standpoint.

Whether or not canned foods have been processed to render them commercially sterile in the aforementioned sense, it is universally conceded that they must be "safely" processed. This specifically refers to the effect on the health of the consumer. A "safe process" is one sufficient to destroy bacteria and their toxins that are harmful to health when ingested with food,

* Read before a Joint Session of the Laboratory and Food and Nutrition Sections of the American Public Health Association at the Sixty-third Annual Meeting in Pasadena, Calif., September 3, 1934.

as well as spores of *Cl. botulinum* if the medium is suitable for their development. Extensive research has shown that in products having a pH below 4.5 the germination of *Cl. botulinum* spores is inhibited, and therefore such products can be safely processed in boiling water (212° F.). Practically all the fruits come in this category and the same applies for a very few other products with pH values up to 5.1. However, in general, from our present knowledge, if the food has a pH above 4.5, a process to be considered safe must be sufficient to destroy *Cl. botulinum* spores of maximum heat resistance.

As early as 1920 it was fully realized in California that to control botulism in commercially canned food scientifically established "safe" processes must be used in conjunction with a rigid and continuous inspection of the packing and processing procedures. Canning inspection in California started in 1920 with placing under the jurisdiction of the Bureau of Pure Food and Drugs of the California State Department of Health the sterilization of ripe olives in accordance with the specifications outlined by Dr. K. F. Meyer, Dr. E. C. Dickson and Dr. J. C. Geiger, members of the so-called "Botulism Commission," who were in charge of the investigation financed by the National Canners Association, Canners League of California, and California Olive Association.

This was followed on March 24, 1922, by the adoption by the California State Department of Health of a set of definite regulations relative to the processes and fill-in weights for commercially canned spinach.

In September, 1924, the control of the canning procedures was transferred from the Bureau of Pure Food and Drugs to a newly formed Division of Cannery Inspection, which was efficiently organized by M. P. Duffy. As consultant to the California State Department of Health, Dr. K. F. Meyer was placed in charge of the scientific investigation to prepare process regulations and supervise the technical control of the packs.

On May 23, 1925, Act 428 was passed and approved by the governor, legally creating a Division of Cannery Inspection to regulate the conduct of canneries and provide rules for the proper sanitation of canning plants. This Act specified the inspection of agricultural products — primarily vegetables, and was amended in 1927 to include the supervision of the canning of fish and meat, so that today everyone in California who engages in the commercial canning of agricultural products, fish and fish products, meat and meat products, not subject to inspection by the Bureau of Animal Industry, is required to have a license from the State Department of Public Health, and the operation of the cannery is subject to the rules and regulations of the Cannery Inspection Service. It further provides for the licensing of retort operators who, before a permit is issued, must satisfactorily pass an examination on the fundamentals of steam sterilization and demonstrate their proficiency in the proper manipulation of retorts. Anyone desirous of packing a product liable to botulinum spoilage on which no process has been established must first have a process worked out that will meet the approval of the State Department of Health and then obtain a permit to pack.

The Cannery Inspection is administered by inspectors, who are state civil service employees under Mr. Duffy. Each cannery which packs products subject to inspection is visited daily during the packing season. Some of the important duties of the inspectors are to make a sanitary survey of the cannery; inspect raw material and equipment; calibrate the mercury and recording thermometers and pressure

gauges on the retort; supervise cannery procedures such as fill, exhaust, double seams, process and coding of containers; examine samples of the pack; and in the event of irregularities in canning or processing put the batch involved under restraint and submit samples to a qualified laboratory for examination. Production records are kept and temperature charts prepared as a control on the sterilization time and temperature. On the "Production Record" is noted the number of cans, code mark, time steam turned on, coming-up time, sterilizing time, readings of both mercury thermometers and pressure gauge, and any other pertinent information. Every effort is made to have available for control purposes a set of data giving the complete picture of the technical procedure required to render canned foods safe.

The coding of cans is an important provision in the regulations. By descriptive marks the inspector or food official can promptly identify a batch of questionable quality and remove it from the consumer's market without being forced to quarantine the seasonal output of a packing plant. In the case of a number of products, notably ripe olives, spinach, sardines and tuna, batch coding is specified; *i.e.*, all cans in a given retort are stamped with the same mark to differentiate them from those in other retorts. This is the smallest unit coded alike at the present time. Coding of other products may be restricted to segregating morning and afternoon packs.

For a number of products, such as artichokes and chili peppers, which in their natural condition are rendered unmerchantable by sterilizing processes, procedures are employed to acidify the product to a pH of at least 4.5.

Whereas the control of foods processed under pressure is by means of checking temperature charts, for acidified products titrations of periodic samples of blanching and brining solutions are made. The fill of cans is also check-weighed daily, and at regular intervals electrometric pH determinations are made on samples of the finished product.

In all cases production records are carefully scrutinized. All food products packed under this inspection must be held by the canner until released by an inspector who, if the records show that all requirements have been met, issues a release order for shipment.

Lots that are restrained are set aside by the inspector, and representative samples are subjected to laboratory tests for sterility or, in the event of spoilage, to determine the cause of the abnormal condition. The number of cans submitted depends upon the nature of the defects or irregularities. When the laboratory findings are completed, and after due consideration of all the available data, the disposition of quarantined lots is decided by the Consulting Bacteriologist to the State Department. In the event of spoilage due to under-sterilization, all the cans involved are usually destroyed.

With this inspection service cases of under-sterilization in the products under surveillance have become rare. In fact, only a relatively insignificant number of the cans packed under inspection are placed under restraint for any cause, yet through this supervision an appreciable number of errors in processing is detected each year, which would otherwise pass unnoticed. Many of these defects are extremely slight and after investigation are found not to have affected the wholesomeness of the product.

At the present time the inspection service is supervising over 50 products, on which definite process regulations have been adopted by the California State Department of Health. The processes recommended for these products have been based upon a standardized procedure involving—

1. A study of the rate of penetration of heat in different sized containers under laboratory and factory conditions with variable filling-in weights.

2. Heat resistance of spoilage organisms, including *Cl. botulinum* spores.

3. Experimental packs of cans inoculated with a definite number of spores of suitable test organisms standardized to have a heat resistance comparable to that of *Cl. botulinum*. Recommended processes are finally obtained by applying a factor of safety to the heat treatment found to sterilize the product in the inoculated cans.

In this work the research laboratories connected with the canning industry have actively coöperated, and our present knowledge of processing non-acid foods is the combined experience accumulated during a period of over 15 years of continuous experimental work. The processes for non-acid foods officially used in California are those published in *N. C. A. Bulletin* 26-L revised, which were adopted by the Directors of the National Canners Association and recommended for general use throughout the country. The collaborative studies are still in progress and as more experimental data become available the adequacy of processes for products liable to botulinum spoilage becomes more firmly established.

To indicate the scope of the laboratory in the technical control of the pack: from January 1, 1928, to July 2, 1934, samples from 370 restrained lots of vegetables and 237 specialty products have been examined. From each batch restrained a minimum of 24 cans, and frequently as many as several hundred, are tested. In addition to these a large number of samples of fish and fish products have been studied. The processing of 275 products, many of which were specialties of a more or less similar composition, has also been investigated. In some instances it was found impracticable to can safely certain products according to the methods contemplated, and packers being convinced of this abandoned the project. However, in most cases proper processing methods were developed.

To determine whether or not the canned contents from restrained lots are "commercially sterile" no one procedure is applicable to all canned foods. Usually it is first necessary to incubate representative cans, and the time and temperature of incubation are more or less arbitrary, depending upon the types of organisms present and the particular class of product to be examined. In some cases it is necessary to use a rather long period because of slowness of growth of certain facultative thermophiles at temperatures below the optimum for development, or delayed germination of certain spore-bearing anaerobes such as *Cl. botulinum*. In relatively unfavorable mediums it might be necessary to store cans for an indefinite period. As a routine procedure to establish the commercial sterility of products with a pH above 4.5 cans should be incubated for at least 4 weeks at 98° F. For foods susceptible to thermophilic spoilage cans should be stored for at least 2 weeks at 98° F., followed by 10 days at 125° F. In the case of products with a pH below 4.5 it may be advisable to incubate at about 80° F. and also at 98° F. After the cans have been incubated for a sufficient time to permit spoilage organisms, if present, to develop, the contents in normal appearing cans are examined with respect to pH, general appearance and odor. If abnormality is detected, further tests may be necessary to confirm the observation. In the event spoilage is indicated from an abnormal external appearance of the can, every effort is made to ascertain the cause.

The technic of bacteriologically examining a canned product is relatively simple in so far as aseptically transferring material to enrichment mediums and other important details are concerned, but to interpret properly the results obtained requires careful analysis

and judgment based upon experience. Whether or not the organisms isolated are actually spoilage types; the significance of hydrogen springers or of thermophilic organisms; the absence of, or the failure to recover organisms in case of bacterial spoilage; the heat resistance of the spoilage organisms recovered; and a number of other questions are involved. Not infrequently one is unable to recover certain types of organisms if the cans are not cultured shortly after spoilage has developed, or even to see bacterial cells by the microscopic examination of stained or unstained preparations. This is particularly true of slow developing thermophiles that die and disintegrate about as rapidly as they develop. In acid products especially, dormant sporing organisms may develop on enrichment, but as growth is inhibited at the low pH their presence has no significance.

The bacteriological findings are only one important link in the chain of evidence necessary to be considered in a proper diagnosis of the cause of spoilage. These should be analyzed in connection with the condition of the can, factory operations, previous experience with the process, extent and amount of spoilage, *i.e.*, whether or not it is general, confined to one day or one line, or whether it is more or less spotted through a given period, and also whether it is confined to lots shipped to certain localities. The cans should be tested for obvious defects, such as perforations or faulty closure, and the interior examined for corrosion effects. In the case of bulged cans the gas in the headspace should be analyzed for this gives presumptive evidence as to whether or not the swelling is bacteriological or due to chemical action. For comparative purposes representative normal cans should be studied.

The possibility of an analyst making a wrong diagnosis, especially if all the facts are not available or are not considered, may be illustrated by the following example, which is typical of problems that are continually being met in dealing with spoiled canned foods.

An analyst receives swelled cans of pears for examination. He cultures these cans according to a certain technic on certain media and incubates the cultures at a certain temperature for so many days, during which time they remain sterile. The acidity of the product is abnormally high (low pH). Nothing definite is observed in the stained preparations examined microscopically. The analyst, with such meager information, is naturally puzzled regarding the cause of the swells.

In dealing with such a case there are many possibilities to be considered. First, is the gas hydrogen or carbon dioxide or a mixture of both? If hydrogen, is this due (1) to chemical action of the product with the container, or (2) to a hydrogen-producing bacterium, or (3) to flat sour spoilage with subsequent hydrogen production through chemical action due to the lowering of the pH of the fruit juice, or (4) to bacterial growth in the fruit before cooking, with lowering of pH and subsequent development of hydrogen? Data on the type and extent of spoilage should also be considered. If both hydrogen and carbon dioxide are present, is the spoilage due to under-sterilization or to leaky seams? Expert judgment as to the condition of the double seams and a knowledge of the canning and processing operations are required to determine the significance of these factors.

Another condition that a food bacteriologist may encounter in his study of spoiled canned foods is the presence of non-heat-resistant organisms in vegetable and meat products in cans having satisfactory seams, or of acid producing organisms in swelled cans. Is the spoilage due to under-sterilization or leakage of bacteria subsequent to

processing? In such cases it is impossible from the bacteriological findings alone to reach a definite conclusion, whereas with a knowledge of canning procedures the trouble is more readily explained.

The subject of spoilage in canned foods is a very complex one, and this becomes more apparent the longer one works in this field. In view of the great number of canned foods, varying in their chemical composition and acidity (pH ranging from below 3.0 to above 8.0), and the many types of organisms that can grow and produce changes, the bacteriological examination of every food, and often of a given lot of a particular product, has to be considered as a separate problem to be studied in the light of the whole previous history of the case. With the ever changing technic of canning procedures, the problems become so complex that only experienced analysts in constant contact with actual canning operations can be expected to solve them.

Smallpox Diminishing

THERE was less smallpox in the United States and Canada in 1933 than ever before, and if we may judge by the records for 7 months of 1934, there will be a further drop this year, in the opinion of the *Statistical Bulletin* of the Metropolitan Life Insurance Company. These 7 months not only show a new low record for the period, but report less than one-tenth the number of only 4 years ago. The fight on smallpox seems nearly won.

Some states, however, still have a bad record, for 4,589, or 75 per cent, of the 6,122 cases reported by 46 states occurred in 12 states that contain only one-fifth of the country's population.* Popular sentiment in these states is against vaccination.

Contrast with these, 10 other states † and the District of Columbia, along the Atlantic seaboard, which had only 4 cases of smallpox in 1933, and only 809 in the last three years.

There is no reason to doubt that this fine record could be duplicated by the rest of the country.

In continental Europe, where compulsory vaccination is generally accepted and practised, smallpox has practically disappeared from all of the countries, excepting Russia and the Iberian Peninsula. In 1931 there was not a single case of smallpox reported in Belgium, Bulgaria, Scotland, Germany, Italy, Luxembourg, Norway, Sweden, Switzerland, and Yugoslavia. Only 1 case each was reported in the Netherlands and Latvia, 5 in Finland, 12 in Greece, 13 in Roumania, and 14 in Poland. France, with a population of over 40 millions, reported only 162 cases.

In England and Wales, on the contrary, where since 1907 "conscientious objectors" have been exempt from compliance with the vaccination laws, the incidence of smallpox has reached such proportions that in 1931 there were reported 5,665 cases, a number far in excess of the total number of cases reported by the whole of continental Europe, excluding Russia.—*New York State J. Med.*, 34, 23:1021 (Dec. 1), 1934.

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* The 12 states with high smallpox records are California, Colorado, Idaho, Oregon, Iowa, Montana, Nevada, Oklahoma, Texas, Utah, Washington, and Wisconsin.

† The 10 states with low records are Delaware, Florida, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, and Rhode Island.

Experiments on the Purification of Creamery and Packing-House Wastes*

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IN the course of some small scale experiments on the purification of creamery and packing-house wastes, several observations were made which might be of interest and possibly of practical significance to those engaged with the problems of waste disposal. The time available does not permit elaboration. The various items will be but briefly considered.

EXPERIMENTS WITH CREAMERY WASTES

Several observations on the effect of bottom ventilation and dosing cycle on purification are considered particularly interesting.

Effect of Bottom Ventilation—Skim milk solutions were applied to a small filter 2′ square and 6′ deep, at a rate of 800,000 gal. per acre per day for about 14 hr. daily.† The filter was constructed of metal and provided with a hopper bottom which terminated in a water seal trap (Figure I). This hopper bottom was provided with air ports so that the filter could be operated either with or without bottom ventilation. The filling material consisted of coarse washed cinders, or rather clinkers, retained on a screen with ½″ openings. The results are detailed in a recent Bulletin [1] of restricted circulation. Figure II, taken from that publication, shows clearly that a very high degree of purification was effected when the air ports were open, permitting adequate and thorough bottom ventilation (wastes of about 1,000 p.p.m. B.O.D. were reduced to effluents of about 10 p.p.m. B.O.D.), but that closing these ports resulted in very rapid deterioration of the purifying efficiency of the apparatus. With bottom ventilation eliminated, the filter clogged badly, and this condition was not remedied by merely opening the air ports; the clogging material had to be washed out to effect relief.

Effect of Dosing Cycle—One filter as above, and another filled with 1½″ to 3½″ rock in place of the cinders, but with the hopper bottoms removed, were dosed simultaneously with a skim milk solution at a constant rate of about 600,000 gal. per acre per day, but the dosing cycles were varied in the range of approximately 2½ min. to 22 min. The purifications effected as indicated by B.O.D. reductions are shown in Table I.

It appears that the dosing cycle had no significant influence on the purification effected by the cinders but that with the coarser rock as a filling material, the short dosing cycle was distinctly preferable, reductions of 90.5

* Read at a Joint Session of the Laboratory and Public Health Engineering Sections of the American Public Health Association at the Sixty-third Annual Meeting in Pasadena, Calif., September 4, 1934.

† Designed by H. N. Jenks, who was associated as a consultant on some of the experiments at Iowa State College.

TABLE I

EFFECT OF DOSING CYCLE AND NATURE OF FILLING MATERIAL ON PURIFICATION OF CREAMERY WASTES

Dosing Cycle		2½ Min.	5–7 Min.	10–12 Min.	20–22 Min.
		B.O.D. (5 days 20° C.)			
Applied Waste		1,010 (±113)	1,020 (±40)	975 (±200)	1,030 (±100)
Eff.	Cinder	4 (±0.5)	5 (±2)	10 (±8)	8 (±4)
	Rock	96 (±23)	94 (±27)	127 (±31)	227 (±54)
Per cent Reduction	Cinder	99.6	99.5	99.0	99.2
	Rock	90.5	90.7	87.0	78.0

per cent, 87.0 per cent and 78.0 per cent being obtained with the 2½ min., 10–12 min. and 20–22 min. dosing cycles respectively.

It was also observed that whereas the dosing cycle had no appreciable effect on the fluctuation in the rate of run-off of the effluent from the cinder filter, the rate of run-off from the coarse rock filter was very markedly affected as is shown in Figure III. The run-off cycle is very significant from the standpoint of sampling and it probably also affects the efficiency of post-filtration sedimentation. Thus, effluents with B.O.D.'s as low as 24, or as high as

TABLE II

PURIFICATION OF PICKLE BRINE BY EXPERIMENTAL STREAM FLOW ACTIVATED SLUDGE PLANT

Waste	8% Pickle Brine			20% Pickle Brine		
Aeration	Raw (0)	6 Hr.	22 Hr.	Raw (0)	6 Hr.	22 Hr.
Org. N.	112	16	29	262	177	104
NH_3	16	38	22	26	87	128
NO_2	5	2.5	2.2	12	5.5	6.0
NO_3	57	1.5	1.4	124	11.3	6.8
O_2 Cons.	1,150	101	93	3,080	610	236
O_2 Dem.	1,190	97	31	2,720	770	140
pH	6.9	7.7	7.9	6.5	7.4	7.6
NaCl	9,380	—	—	20,265	—	—

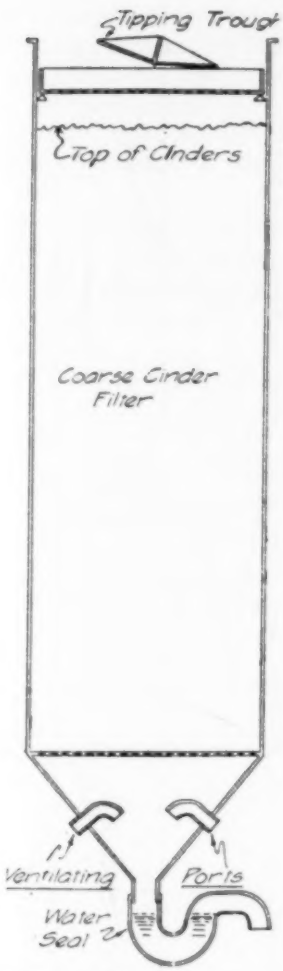


FIGURE I—Cross-section of the experimental laboratory filter

428 could be obtained, depending on the point in the effluent cycle at which the sample was collected. In the experiments reported here (which are considered of a preliminary nature and are being studied further) this sampling error was eliminated by including in the sample all of the effluent during a complete cycle.

EXPERIMENTS WITH PACKING-HOUSE WASTES

Some studies were made on a small scale to ascertain: (1) whether the high salt content precluded the use of the activated sludge process for treating packing-house wastes; (2) the effect of aeration of a deep trickling filter; and (3) the feasibility of employing double filteration (the first filter being decloggable by back-washing) for purification of packing-house wastes.

Observations with the Activated Sludge Process—An activated sludge plant was in existence at Mason City, Iowa, for treatment of packing-house wastes. The purification effected was not satisfactory (45–55 per cent) and rumors were current that the poor results were due to the salt (1,200 to 1,500 p.p.m.) present as sodium chloride. This conception was so prevalent that it was felt necessary to demonstrate that this was not the cause of the difficulty.

An activated sludge was prepared by circulation of packing-house waste in an experimental stream-flow aeration device (Figure IV) which has been previously described by Jenks and Levine.[2] The tank was then charged with an 8 per cent and 20 per cent pickle brine. The results are shown in Table II, from which it is apparent that the activated sludge process functioned effectively even in the presence of 20,000 p.p.m. NaCl when operated on a fill and draw basis. The poor efficiency of the continuous flow activated sludge plant previously referred to could not be due to the salt content of the waste which was only about 1,200 p.p.m., and is attributed to the very excessive fluctuations in the concentration of the wastes reaching the purification plant.

Purification by Double Filtration (Aerated Filter)—Packing-house waste which had been settled for about 1½ hr. was applied to a filter 3½′ square, and 10′ deep at a rate of 7×10^6 gal. per acre per day for a period of 6 months. The filling material consisted of 1 to 2½″ red granite. The filter

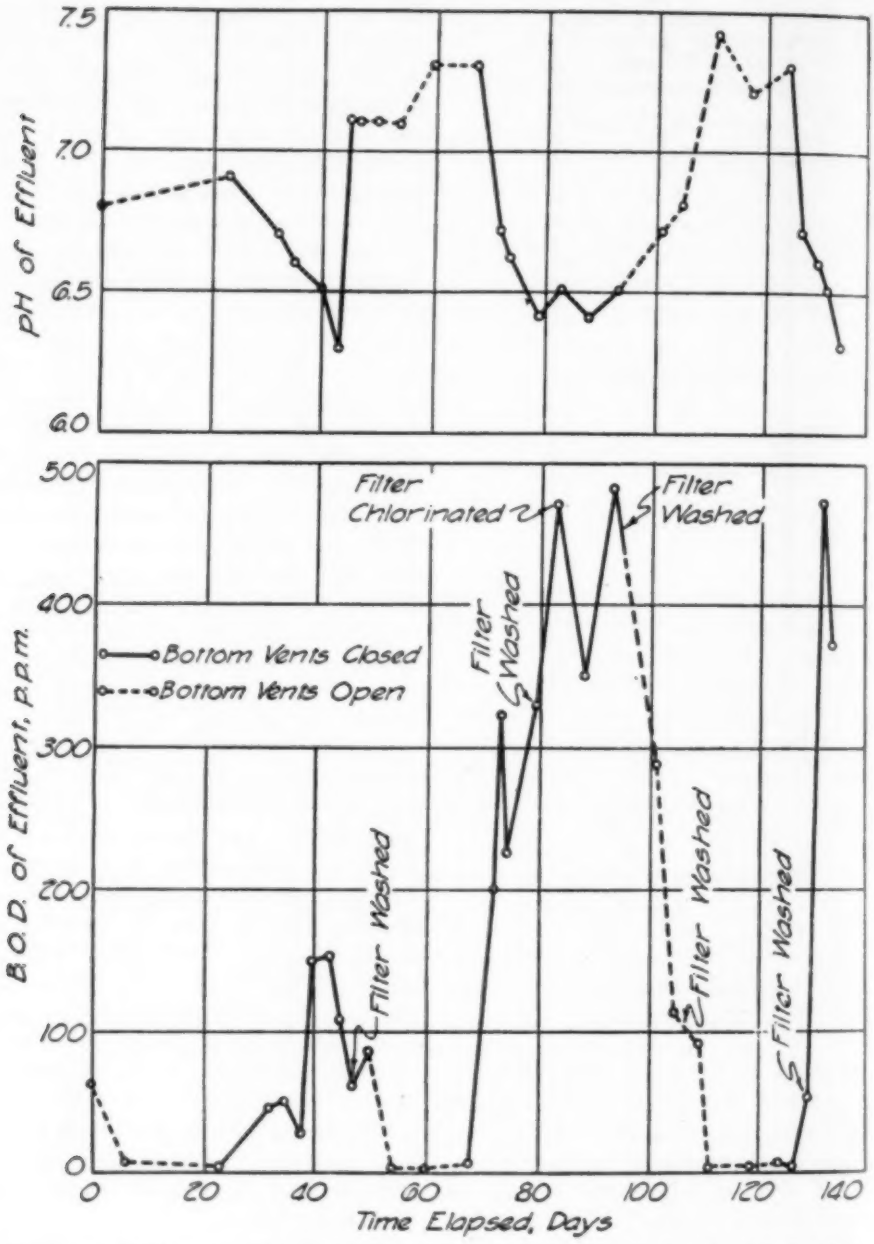


FIGURE II—Effect of bottom ventilation of trickling filter B on the biochemical oxygen demand and reaction of the effluent

was constantly aerated through a perforated grid on its bottom.

The purification effected was very satisfactory (about 40 per cent B.O.D.) considering the high rate of application, and there was no evidence of serious clogging. The effluent from this aerated filter was settled in a small Imhoff tank and then applied to a cinder or coarse gravel filter, 3′ square and 8′ deep, at

a rate of 3×10^6 gal. per acre per day. The results are summarized in Table III.

It may be seen that a very high degree of purification was effected. Filtration at 7×10^6 on 10′ of aerated coarse rock effected a reduction of 40.9 per cent in B.O.D. and 54 per cent in organic nitrogen, but the ammonia increased considerably. Sedimentation of this effluent increased the B.O.D. removal to 49.9 per cent and the organic nitrogen removal to 71 per

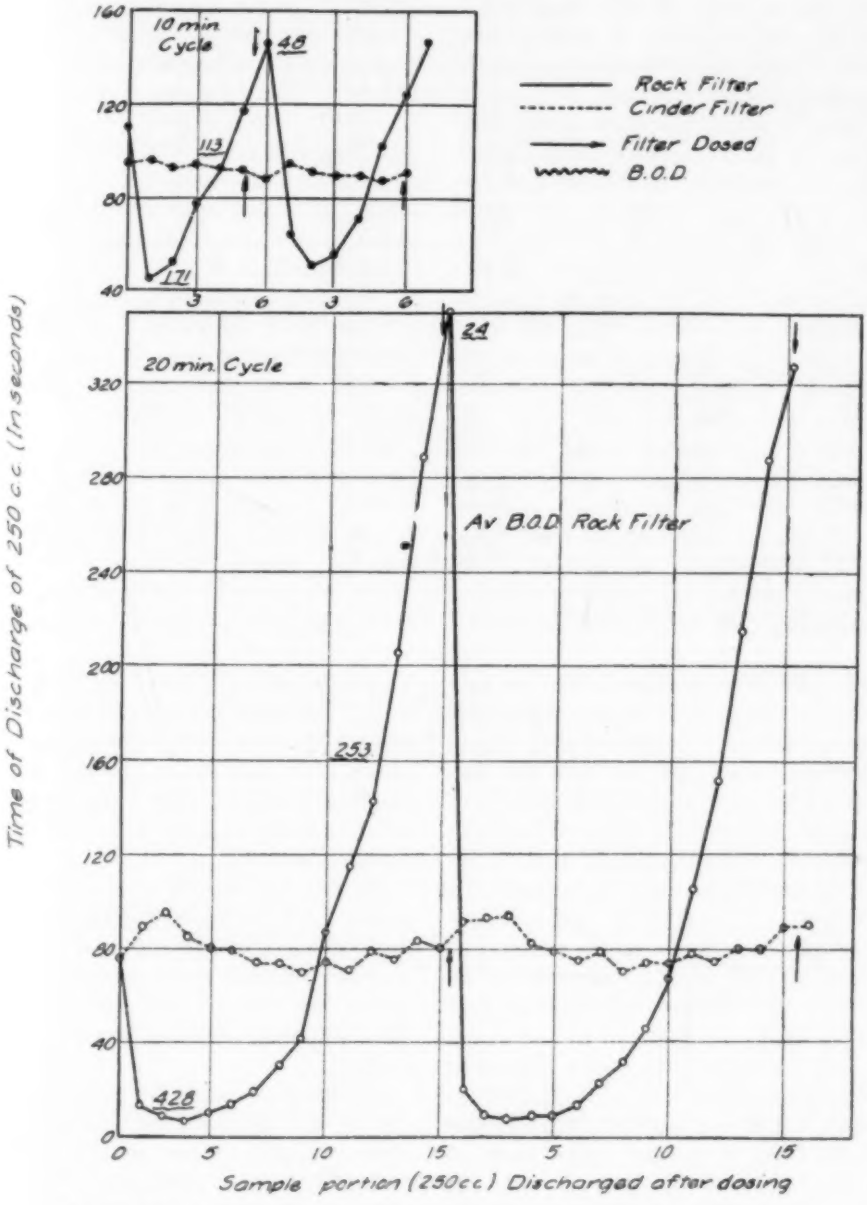


FIGURE III—Effect of dosing cycle and nature of filling material on rate of discharge of effluent

TABLE III

PURIFICATION OF PACKING-HOUSE WASTE BY DOUBLE FILTRATION
(AERATED FILTER SERIES)

	(1)	(2)	(3)	(4)	(5)
	Applied Waste	Eff. from aerated 10 ft. filter at 7×10^6 gal. per acre per day	Settled * Eff. from (2)	Eff. from 8 ft. cinders at 3×10^6 gal. per acre per day	Eff. from 8 ft. coarse gravel at 3×10^6 gal. per acre per day
Org. N.	115	52.5	33.2	5.8	10.9
NH_3	35	2.0	83.0	19.4	31.6
NO_2	0.6	0.58	0.06	1.7	1.5
NO_3	2.4	0.95	0.8	40.1	44.4
O_2 Cons.	334	246	185	79	109
pH	7.1	7.5	7.6	7.7	7.7
O_2 Dem.	929 ($\pm$200)	549 ($\pm$156)	465 ($\pm$101)	29 ($\pm$17)	57 ($\pm$27)
No. of Sample	56	55	37	40	40
		Over-all per cent reduction			
Org. N.		54.3	71.0	95.0	90.5
NH_3		†	†	44.6	10
O_2 Cons.		32.2	44.6	76.3	69.7
O_2 Dem.		40.9	49.9	96.8	93.9

* Constitutes waste applied to cinder and gravel filters.
† Increase.

cent. Further treatment of this partially purified and settled waste by application onto cinders and gravel filters at 3×10^6 gal. per acre per day effected over-all reduction in B.O.D. of 96.8 per cent and 93.9 per cent respectively, and correspondingly high reduction in organic nitrogen (95.0 and 90.5 per cent). Nitrification was particularly good, 40 to 44 p.p.m. of nitrates being present in the effluents which consequently showed stabilities of over 90 per cent.

Purification by Double Filtration (Washable Filter)—A settled packing-house waste was applied to a shallow cinder filter, 3′ square and 3′ deep, at a rate of 4×10^6 m. gal. per acre per day, and the effluent, after resettling in an Imhoff tank, was applied to a filter 3′ square and 8′ deep, containing 1 to 3″ dolomite, at a rate of 3×10^6 gal. per acre per day. The primary or cinder filter was so constructed that it could be washed free of clogging materials by back washing with water and agitation with air.

The results, for a period of about 3 months, are shown in Table IV. The waste during the experiments (March to June) was not as strong as that employed in the aerated filter studies. The purification effected was very satisfactory.

Filtration through 3′ of cinders at 4×10^6 gal. per acre per day effected reduction of 56.5 per cent in B.O.D. and 34.7 organic nitrogen. These reductions were increased to 59.2 per cent and 51.1 per cent for B.O.D. and

organic nitrogen respectively, by sedimentation in a small Imhoff tank. Further treatment of the effluent from the Imhoff tank on an 8′ dolomite filter, 1″–3″ filling material, at 3×10^6 gal. per acre per day effected over-all reduction of 93.2 per cent in B.O.D. and 83.7 per cent organic nitrogen. Nitrification was very good, the effluents contained an average of 20.8 p.p.m. of nitrates and were stable (relative stability over 90 per cent).

Purification of Packing-House Wastes by Double Filtration—In 1929 a plant designed on the principle of the washable filter just described was put into operation at the Jacob E. Decker Packing Company at Mason City, Iowa. It consists of a modified Dorr settling tank with 1½ to 2 hr. sedimentation, followed by treatment on ¼ acre of a shallow washable filter, at about 3×10^6 to 4×10^6 gal. per acre per day, and the effluent from this filter, after settling for 1½ to 2 hr., is applied to a dolomite filter ½ acre in area and 8′ deep at 1.5×10^6 to 2×10^6 gal. per acre per day, the filter effluent being subjected to final sedimentation in a modified Dorr clarifier before discharge into the stream. The primary washable filter which at first contained cinders, was later changed to ½″ to 1″ dolomite. The secondary, deep 8′ filter, was filled with 1″ to 3″ dolomite.

The plant was designed to handle 750,000 gal. per day, with a maximum rate of flow of 1,000,000 gal. per day through the purification plant, during a part of the day, and it was anticipated that with a maximum initial B.O.D. of 1,000 p.p.m. a reduction of 85 to 90 per cent would be obtained, *i.e.*, the maximum reduction anticipated, was 5,300 to 5,600 lb. B.O.D. per day.

The results for the year 1933 are summarized in Table V. The effluent from the first settling tank, which is applied to the washable filter, is referred to as the " primary clarifier "; the effluent from the washable filter after settling, which constitutes the waste applied to the deep filter, as the " intermediate clarifier "; and the effluent from the final filter, after settling, as the " final clarifier " in Table V.

The average volume of sewage treated during the year 1933 was about

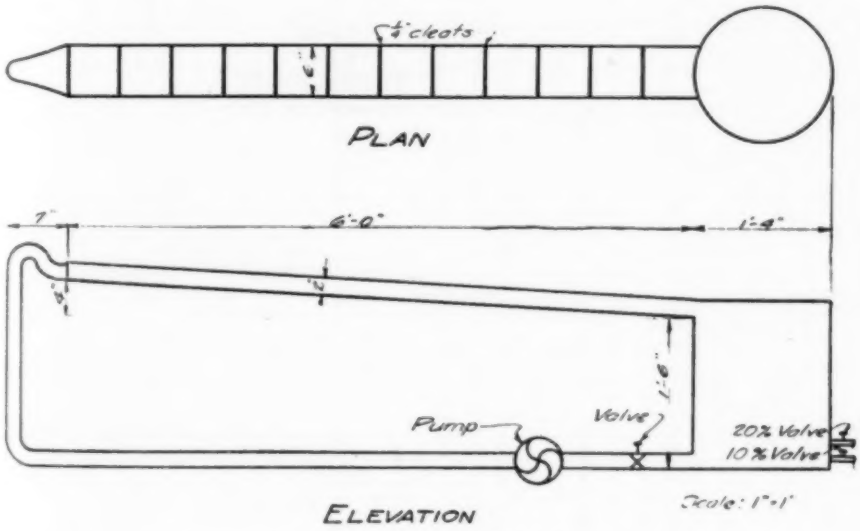


FIGURE IV—Diagrammatic sketch of experimental stream flow aeration unit (after Jenks & Levine)

TABLE IV

PURIFICATION OF PACKING-HOUSE WASTE BY DOUBLE FILTRATION
(WASHABLE FILTER SERIES)

	(1)	(2)	(3)	(4)
	Applied Waste	Eff. from 3 ft. washable filter at 4 x 10^6 gal. per acre per day	Settled Eff. from (2) *	Eff. from 8 ft. Dolomite at 3 x 10^6 gal. per acre per day
Org. N.	43	28	21	7
NH_3	28	40	44	17
NO_2	0.3	0.2	0.0	2.2
NO_3	1.5	0.85	0.6	20.8
O_2 Cons.	195	128	107	57
pH	7.2	7.4	7.5	7.8
O_2 Dem.	632 (±142)	274 (±100)	258 (±100)	44 (±20)
No. of Sample	38	38	38	38
Over-all per cent reduction				
Org. N.	—	34.7	51.1	83.7
NH_3	—	†	†	39.1
O_2 Cons.	—	34.1	45.1	70.7
O_2 Dem.	—	56.5	59.2	93.2

* Constitutes waste applied to Dolomite (1 to 3″) filter.
† Increase.

TABLE V

PURIFICATION OF PACKING-HOUSE WASTE AT MASON CITY, IOWA, FOR THE YEAR, 1933.

	Raw Waste	Primary Clarifier	Intermediate Clarifier	Final Clarifier
Org. N.	150.4	97.9	54.3	12
NH_3	46.5	63	81.3	35
NO_2	–	–	–	1.6
NO_3	–	–	–	9.8
O_2 Cons.	521	359	256	142
O_2 Dem.	1,437 (±402)	1,020 (±253)	534 (±232)	82 (±81)
No. of samples for B. O. D.	201	197	198	202
Over-all per cent reduction				
Org. N.	–	34.7	63.8	92
NH_3	–	–	–	24.7
O_2 Cons.	–	31.1	58.6	72.7
O_2 Dem.	–	29.0	62.8	94.3

600,000 gal. per day and the maximum volume 900,000 gal. per day. The average B.O.D. of the applied waste was 1,437±404, the minimum for any one day 650, and the maximum 3,850. The purification effected by the various portions of the sewage treatment plant are also shown in Table V. Over-all reduction of 92 per cent organic nitrogen, only 29.7 per cent ammonia, 72.7 per cent oxygen consumed and 94.3 per cent oxygen demand were effected.

A more detailed idea of the workings of the various portions of the plant may be obtained by examining Figures V and VI, from which it will be noted that 50 per cent of the applied wastes had B.O.D.'s of between 700 and 1,400 p.p.m., while 50 per cent of the final effluents showed B.O.D.'s between about 20 and 56 p.p.m. The next higher 30 per cent of the samples of applied wastes had B.O.D.'s between 1,400 and 1,800 p.p.m. and the effluents between 56 and 110 p.p.m. B.O.D. Finally, 20 per cent of the raw wastes had B.O.D.'s of over 1,800 (2 per cent over 2,500) and 20 per cent of the effluents were over 110 p.p.m. (2 per cent over 250 p.p.m.) B.O.D.

The per cent reduction of B.O.D. is a reasonable figure for comparing the efficiency of the various portions of the plant on any given day, or for different days, if the volume and concentration of applied wastes are constant, but in view of the fluctuation in volume of waste treated from day to day, analysis on the basis of the total pounds of B.O.D. removed is probably a more dependable measure of the plant efficiency. An analysis of the efficiency of

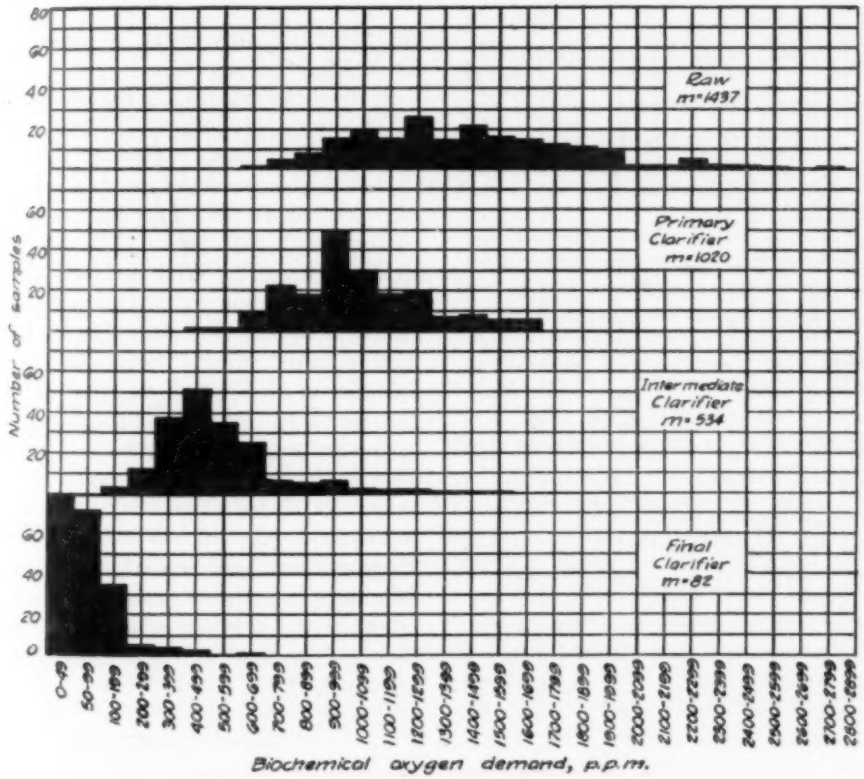


FIGURE V—Purification of packing-house wastes

TABLE VI

REMOVAL OF B.O.D. (IN POUNDS) BY PACKING-HOUSE WASTE PURIFICATION PLANT AT MASON CITY, IOWA, 1933

	Raw	Primary clarifier effluent	Intermediate clarifier effluent	Final clarifier effluent
B.O.D. (in pounds) (average for year)				
Present	6,880	4,335	2,347	328
Reduction by unit	—	2,545	1,988	2,019
Over-all reduction	—	2,545	4,533	6,552
Per cent reduction				
By unit	—	37	45.9	81.8
Over-all	—	37	65.8	95.2

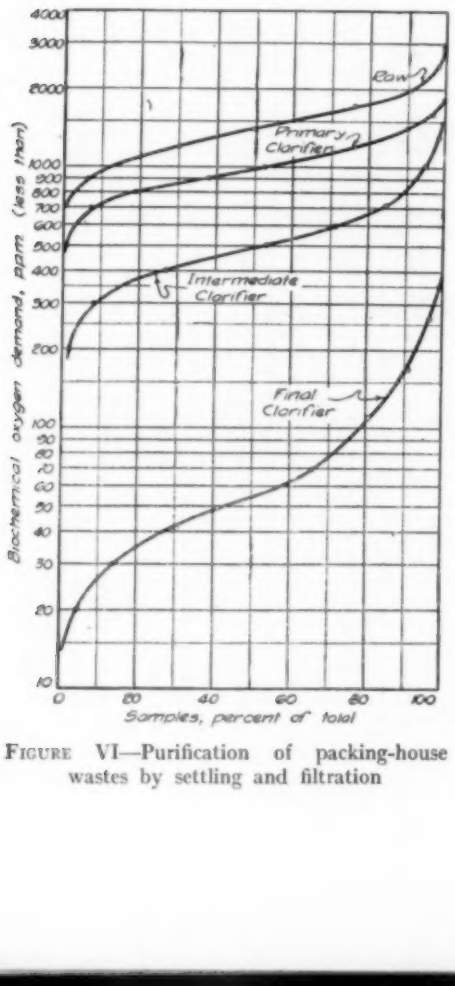


FIGURE VI—Purification of packing-house wastes by settling and filtration

the plant on this basis is shown in Table VI.

In short, sedimentation for about 1½ hr. effected a reduction of 37 per cent B.O.D. Treatment of the effluent on 3′ of rock at an average rate of 2.4×10^6 gal. per acre per day followed by settling, reduced the B.O.D. of the applied effluent by 45.9 per cent or an over-all reduction of 65.8 per cent. Finally, application of this settled shallow filter effluent on 8′ of coarse dolomite at an average rate of 1.2×10^6 gal. per acre per day and settling resulted in a further reduction of 81.8 per cent in B.O.D. of the applied waste or an over-all reduction of 95.2 per cent.

The over-all removal of B.O.D. by filtering and sedimentation of filter effluents (exclusive of primary sedimentation of the raw waste before application to the filters), was 633 lb. per acre-foot.

SUMMARY

Data are presented on some experi-

ments in the treatment of creamery and packing-house wastes and results of a full size plant for treating packing-house wastes, which indicate that the full capacities of trickling filters are not generally utilized in treatment of domestic sewage.

REFERENCES

1. *Bull. 116,* Iowa Engineering Experiment Station.
2. *Eng. News Rec.,* 100:808–813, 1928.

DISCUSSION

CHARLES GILMAN HYDE, F.A.P.H.A.

Professor of Sanitary Engineering, University of California, Berkeley, Calif.

IN this paper the author has made a valuable contribution to the art of industrial wastes treatment. The paper contains not only a wealth of information but much suggestive material which offers food for thought. For instance, the effect of excessive and greatly varying loads upon activated sludge plants is referred to and indicates a possible explanation of difficulties experienced at times with that type of plant.

At least 4 very interesting phases of the general subject are presented:

1. The basic laboratory experiments covering two distinctly different methods of treatment of very strong industrial wastes: (a) the activated sludge process on the so-called stream-flow principle: (b) trickling filtration.
2. The model plant experiments utilizing two-stage trickling filtration and developing apparently authentic results.
3. The application of the procedure of the model plant to full scale in treating a relatively large volume of wastes of extreme variability in composition and of extraordinary strength or concentration.
4. The operation of the practical, full scale plant through a 5 year period and the presentation of the results obtained during the last or 5th complete year of operation.

Diagrams V and VI are of particular interest as exhibiting methods of exposition of analytical results. Diagram VI is especially noteworthy in that it shows at a glance the performance of the plant with reference to B.O.D. removal. The spread of the analytical determinations representing the performance of each stage of the treatment process is graphically shown to great advantage.

To an increasing extent industrial wastes are attracting the attention of sanitary engineers and laboratory technicians both from the standpoint of possible salvage and that of treatment to prevent excessive stream pollution and nuisances.

It is refreshing to have, as in this paper, a review of the results actually achieved by a full scale plant which has been operated through a period of several years and not merely one which has just been designed with the fervent hope of successful accomplishments. Engineering literature is replete with prophecies but too frequently silent or arid with respect to actual realizations and accomplishments.

Unfortunately, where biological agencies play a significant part in the ultimate results, the " model law " is not always apparent; and perhaps never to the extent that it is in the field of structural and hydraulic experimentation. For this reason, while " bottle " experiments have their indisputable place, the results secured therewith cannot be applied with assurance to full scale plants. Batch treatment is not to be compared with variable flow treatment. The author wisely supplemented bottle or batch experiments with flow experiments through a model plant of such size as to yield reasonably authentic results which could be extrapolated to the conditions of a full scale plant. This procedure is particularly desirable,

even necessary, when the method of treatment is unique, as in the case in question.

Standard practice in trickling filtration makes use of coarse grained aggregates rather than fine grained materials such as sand or cinders. The author has clearly shown the advantage of short dosing periods or cycles where coarse rock is employed in trickling filters, and especially when these are subjected to heavy and widely varying loads. The importance of bottom ventilation under such conditions has been clearly demonstrated.

The author is to be congratulated in that he has developed a type of treatment applicable to enormously variable and extremely heavy loadings and one which, on the basis of B.O.D. removal, seems to be relatively cheap in installation and operating costs.

The author does not describe the design and construction features of the working plant whose operating results he so interestingly and instructively sets forth. It is very desirable that this be done and it is hoped that in the near future he, perhaps in collaboration with the designing engineers, will prepare an adequate description of that plant from the design and construction standpoints.

Health Statistics of New York

INFANT mortality, tuberculosis deaths and cases, and other health statistics are now compiled regularly for each health area in the City of New York by the Health Department. Various welfare organizations are at work collecting information concerning juvenile delinquency, services rendered by philanthropic agencies, residence of patients discharged from hospitals, and other data, all on the basis of residence in health areas.

In addition to the statistics given in *Heads of Families,* and other volumes in the series of studies of neighborhood statistics, information is available in the Research Bureau of the Welfare Council of New York City, 122 East 22 Street, New York, on the smaller divisions which make up the health areas. These smaller divisions are census tracts and for them the U. S. Census Bureau compiles the statistics which form the source material of the Welfare Council studies. Each census tract is approximately 40 acres in area and there are some 3,400 tracts in New York City.

Other studies of neighborhood statistics which contain information regarding every health area in the five boroughs of New York are *Population in Health Areas,* which gives the population by age groups and by color, nativity, parentage, and sex, and *Homes by Tenure and Value or Monthly Rental.*

A Nutritional Survey of Forty-five Hundred Children on Relief*

J. C. GEIGER, M.D., F.A.P.H.A., AND PAUL S. BARRETT, M.D.

Director of Public Health; and Director, Bureau of Child Hygiene, Department of Public Health, San Francisco, Calif.

LESS than a year ago the Children's Bureau of Washington, D.C., called a conference to consider the reported increase in malnutrition due to the depression.

This reported increase was based on studies from New York City, Massachusetts rural regions, and a Philadelphia relief group, notwithstanding the fact that a number of public health workers had called attention to the lack of objective standards of nutrition. Others had emphasized the fact that current morbidity statistics did not point to widespread emergency and the writer in a letter dated September 27, 1933, addressed to a member of the Child Health Recovery Committee wrote:

> In conclusion, I might say that it is the opinion of all the workers in the Department that the nutrition of San Francisco children has not materially suffered, and I even could go so far as to say that never before have the families on relief been under such competent medical supervision. Malnutrition may exist in the isolated case of a child whose family is too proud to ask for relief, or in that group of transients whose movements are difficult to check and who are not under adequate supervision, and who are part of the vexatious nonresident problem.

On March 1, 1934, the Emergency Relief Committee of San Francisco changed its policy in administering relief. Prior to that date relief was on a commissary basis, that is, boxes of food were distributed to families, fresh milk was delivered, and in addition a weekly stipend was allowed for the purchase of fresh meat. Beginning the first of March this system was changed to a cash relief basis for a trial period of 6 months. Families on relief received a weekly check with which they were to purchase their own food supply. It was felt by the committee that a survey of the nutritional status of the children who had been on this commissary system for the periods varying from 6 months to 2 years would show whether or not it had resulted in maintaining the nutrition of the recipients of relief. Upon their request the Department of Public Health undertook a systematic measurement and examination of the children of all families on relief.

Until recently standards of nutrition have been extremely unsatisfactory. Estimates of deviation from normal based on a specific weight for age and height are notoriously inaccurate. The A.C.H. Index, recently developed by Franzen & Palmer,[1] gives a satisfactory standard of nutritional status. This index is based on 3 measurements, arm

* Read before the Child Hygiene Section of the American Public Health Association at the Sixty-third Annual Meeting in Pasadena, Calif., September 6, 1934.

girth (A), chest depth (C), and hip width (H). These measurements subjected to two additions, a subtraction and reference to a table, serve to identify children with a marked discrepancy between the amount of soft tissue (muscle and fat) and the amount of bony tissue (skeletal build). Previously to the publication of this work, Pryor & Stolz [2] had submitted a somewhat similar plan to estimate normal weight, using a length-width index based on the height of the child and the width of the iliac crests. This length-width index of body build is used not only to designate types of build but also as a basis for weight prediction, a feature not present in the A.C.H. Index. The bi-iliac diameter divided by the height times 100 gives the length-width index and is a measure of the relative width of the body. The bi-iliac diameter can be measured more accurately than chest width or shoulder width because it is not affected by respiratory movements or changes in posture. This greater accuracy of the bi-iliac diameter can be demonstrated when two observers measure the same children.

Various complicated indices of body build have been advocated, each involving several body measurements of girths and diameters. A comparison of these measurements with the single bi-iliac diameter, each in percentage of height, shows the same classification of body build for each system.

The bi-iliac method was the method of choice because it was more constant, more accurately and more easily measured, and yielded the same results. An added feature was that a control group of California children was available by this system. This control group included 2,000 public school children in San Francisco, Oakland, and San Mateo, 700 clinic patients at University of California Hospital, 300 at Children's Hospital, 300 private school boys, and 60 children in a special survey in Berkeley. The method of procedure was as follows:

Four regional centers were established, one in the main building of the Health Department and two in branch offices in the Mission and Alemany districts, the fourth center was in the North Beach section, the space being donated by the Telegraph Hill Neighborhood Association. Physicians to conduct the survey were furnished by the Emergency Relief Committee. Nurses and clerical force were obtained through the C.W.S.

The Emergency Relief Committee then set about getting the children to appear for examination, which was done through the Relief Visitors who were

We are undertaking a Nutritional Survey or a Health Study of children. Will you send

(Names of Children) .....

to ..... Health Center at

(Address) .....

at ..... on ....
(Time) (Day) (Date)

Carfare will be supplied if necessary. Arrangements have been made with the School Department to excuse the children for those hours.

(Address) .... (Visitor)

FIGURE I

We find that you have not taken advantage of the opportunity afforded by the Board of Health to learn the physical condition of your children. If you were unable to send the children before, have them report to

..... Health Center

at (Address) .....

at ..... (Time) on ..... (Day) ..... (Date)

The School Dept. will excuse the children for those hours. We hope you will coöperate in the interest of your children's health.

District No. .... (Visitor)

FIGURE II

made responsible for referring all children under their supervision to the Nutrition Centers. Postcards (Figure I) were mailed to parents inviting them to bring their children to the Nutrition Center for a physical examination and check-up and giving them definite appointments for the examination. Appointments were made for 50 children for each morning and afternoon session at all of the four centers. Each day names of those children reporting for examination were sent to the Relief Committee. This enabled the Relief

Name				Place and Date of Birth	Sex .....
Address				School	Grade .....
Date				Nationality of Father	
Age				Nationality of Mother	
Bi-iliac Diameter				Illnesses	
Height					
Weight					
Normal Weight					
Variation				Summary	
Muscle Tone					
Posture					
Physical Defects					
Physician					

FIGURE III

TABLE I

SAN FRANCISCO DEPARTMENT OF PUBLIC HEALTH

NUTRITIONAL SURVEY PROJECT—1934

PRESCHOOL GROUP

(Total number of children examined—870)

Condition	Defect	Alemany	Central	Mission	Telegraph Hill	Total
	Extreme malnutrition	0	0	4	6	10
Skin	Communicable:					
	Impetigo	0	3	3	0	6
	Pediculosis	1	0	1	7	9
	Scabies	0	3	2	0	5
	Ringworm—scalp	0	1	1	0	2
	Ringworm—skin	0	1	0	0	1
	Non-communicable:					
	Not classified	1	4	0	1	6
	Eczema	1	0	7	8	16
	Urticaria	1	0	0	2	3
Orthopedic	Pronated feet	0	0	1	2	3
	Poliomyelitis (post-paralysis)	0	1	0	0	1
	Rachitic condition	0	1	6	1	8
Eye	Defective vision	0	2	1	3	6
	Corrected vision	0	4	1	0	5
	Strabismus	0	0	0	1	1
	Conjunctivitis	0	0	2	0	2
Ear	Defective hearing	0	0	0	0	0
	Chronic otitis media	0	0	0	0	0
Heart	Functional murmur	3	0	3	18	24
	Organic murmur	0	0	2	0	2
	Disturbance of rate	0	0	0	0	0
Lungs	Asthma	0	3	1	4	8
	Bronchitis	0	8	2	4	14
	Tuberculosis suspect	0	2	1	1	4
Teeth	Carious	11	20	45	11	87
	Prophylaxis (alone)	0	0	0	0	0
Mouth, Nose and Throat	Mouth breather	0	2	1	0	3
	Tonsils simple	22	11	66	26	125
	Tonsils infected	8	36	11	28	83
	Glands (cer.)	4	2	9	2	17
Nervous System	Defective mentality	2	0	0	0	2
	Defective speech	0	1	0	1	2
	Chorea	0	0	0	0	0
	Functional nervousness	0	0	0	0	0
Endocrine and Development	Thyroid	0	0	0	0	0
	Pituitary	0	1	0	0	1
	Hydrocephalic	0	0	0	1	1
Miscellaneous	Hernia (umbilical)	2	1	1	2	6
	Hare lip	0	0	0	1	1

Visitors to determine which children did not report and a second post-card (Figure II) was sent to them urging attendance. The response was excellent, over 4,500 children reporting for examination in 7 weeks. The interest and coöperation of the public schools was secured, and a notice was printed in the School *Superintendent's Bulletin* requesting that principals excuse these

children from school upon presentation of their card from the Relief Committee.

After registration, the child was undressed and his weight and height were recorded on the physical examination card (Figure III). He was then presented to the physician who measured the bi-iliac diameter and proceeded to make a careful physical examination including an estimate of the posture and muscle tone expressed as "Good," "Fair," or "Poor." The normal weight and variation from the normal were not calculated at time of the examination. All physical defects found were recorded, and when necessary full notations were made on the reverse side of the child's card describing significant findings. The parent was given a slip of paper (Table IV) on which was indicated the need for medical attention, and was directed to report to the Relief Visitor on whom the responsibility for arranging for such attention had been placed. The Relief Visitor had also been given a duplicate of the form for parents and so was in a position to check on whether or not the physician's directions were being followed. Although the primary objective of the survey was to secure accurate data on the nutritional status of the San Francisco children on relief, the opportunity to do an intensive health promotion project was in this way not lost sight of.

For the purpose of tabulating results the children were divided into two age groups, the preschool group under 6 years and the school group, 6 to 16 years. The defects found among the preschool group were noticeably few. Of 840 children, only 10 were found with extreme malnutrition, estimated clinically. Eight apparently were found in the estimation of nutrition by the measurement method (Table III), corroborating the subjective estimate made by the physician at the time of examination. Without exception these children had never attended a Child Welfare Conference and their feeding and hygienic regimen had at no time been under the direction of a physician. The remainder of the preschool group was remarkably free from defects. Among the school group the outstanding defects paralleled those found in routine school examinations, teeth and tonsils leading. The presence or absence of defects appeared to have no relation to nutritional status. An interesting sidelight on the examinations was that when severe physical defects of heart or lung were reported, check with the school health records invariably revealed identical notations and, in most cases, the child was found to be already under regular medical supervision. A tabulated list of the defects found by districts for each age group is given in Tables I and II.

After the examinations were completed the normal weights were estimated according to the tables furnished by Pryor & Stolz [2] and the variation from the normal calculated by taking

San Francisco Emergency Relief
Committee
51 Gough Street,
San Francisco, California

Date .....

Family Name .....

Man's First Name .....

Woman's First Name .....

Address .....

Baby's Name .....

..... M.D.

.....
(Clinic or Health Center)

File No. ..... Visitor .....

FIGURE IV

TABLE II—SAN FRANCISCO DEPARTMENT OF PUBLIC HEALTH NUTRITIONAL SURVEY PROJECT—1934—AGE GROUP 6–16 YEARS

(Total number of children examined—3,645)

	Defects	*Alemany*	*Central*	*Mission*	*Telegraph Hill*	*Total*
Condition	Muscle tone II	307	739	291	380	1,717
	Muscle tone III	35	22	45	127	229
Skin	Communicable:					
	Impetigo	0	6	4	8	18
	Pediculosis	11	0	17	38	66
	Scabies	1	5	10	6	22
	Ringworm—scalp	0	0	2	0	2
	Ringworm—skin	1	1	2	0	4
	Non-communicable:					
	Acne	1	1	6	5	13
	Eczema	3	1	6	5	15
	Vitiligo	0	0	2	0	2
	Allergic	1	0	2	1	4
	Not classified	10	0	0	0	10
Orthopedic	Posture II	340	942	472	447	2,201
	Posture III	87	49	32	124	292
	Scoliosis	3	0	5	0	8
	Pronated Feet	0	0	2	2	4
	Rachitic conditions	8	8	15	0	31
	Poliomyelitis	0	1	2	0	3
Eye	Defective vision	6	18	0	9	33
	Vision corrected	0	1	5	8	14
	Strabismus	0	2	5	7	14
	Conjunctivitis	0	1	0	2	3
	Marginal blepharitis	1	6	3	2	12
Ear	Defective hearing	0	2	1	3	6
	Otitis media chronic)	0	2	0	0	2
Heart	Functional murmur	13	12	6	46	77
	Organic murmur	5	3	3	2	13
	Disturbance of rate	1	1	3	0	5
	Disturbance of rhythm	0	0	1	0	1
Lungs	Asthma	0	2	3	5	10
	Bronchitis	3	7	4	8	22
	Tuberculosis suspect	1	5	3	10	19
Teeth	Carious	282	445	557	220	1,504
	Prophylaxis (alone)	13	2	65	14	94
Mouth, Nose and Throat	Mouth breather	3	15	14	5	37
	Enlarged tonsils	109	100	259	173	641
	Tonsils diseased	23	19	10	31	83
	Cervical adenitis	10	4	51	14	79
	Sinusitis	2	1	6	4	13
Nervous System	Defective mentality	0	3	3	4	10
	Defective speech	0	0	1	3	4
	Chorea	0	1	0	0	1
	Nervousness (functional)	1	3	1	2	7
	Epilepsy	0	0	0	1	1
Endocrine and Development	Thyroid enlargement	3	0	2	8	13
	Pituitary	0	0	1	1	2
	Obesity (not classified)	3	0	1	0	4
	Microcephalic	0	0	0	1	1
Miscellaneous	Cleft palate and hare lip	2	1	1	0	4
	Cleft palate	0	0	1	0	1

TABLE III

SAN FRANCISCO DEPARTMENT OF PUBLIC HEALTH NUTRITIONAL SURVEY PROJECT—1934

PRESCHOOL GROUP

Percentage Group	*Total*	*Percentage of Total*
Overweights		
17–20%	4	0.45
13–17%	13	1.49
9–13%	38	4.36
5– 9%	98	11.26
1– 5%	238	27.35
Normal	116	13.33
Underweights		
1– 5%	217	24.94
5– 9%	105	12.06
9–13%	33	3.79
13–17%	7	0.80
17–20%	1	0.11
Total	870	

the difference between actual and normal weight. The number and percentage of the total group and the percentage of their variation from the normal is shown in Tables III and IV. This group compared with a control group is graphically shown in charts (Figures V and VI).

DISCUSSION

The interpretation of these figures and the conclusions to be drawn from them are at present a subject for discussion.

In the school group (Figure VI) it is possible to say that 11 per cent are 10 per cent or more underweight, and in the preschool group (Figure V) less than 5 per cent are in this classification. Comparing this with the control group the figures are 13 per cent and 8 per cent respectively. Certainly it would seem logical to draw the conclusion that underweight for body build was not more, or even *as* prevalent among the relief group as among the control group.

Referring to the graphic chart of the school group (Figure VI) the widest variation occurs with the children 5 per cent underweight, a variation of 7 per cent rapidly converging to the point 5 per cent overweight. From that point on to the extreme overweight the relief group is convincingly in the majority.

With even a conservative interpretation of these findings it must be admitted that the nutritional status of children who had been on commissary relief compare very favorably with a normal or even more privileged group in the community.

The homographic aspect of the preschool group chart needs but little comment. However, it would seem to refute, for San Francisco at least, the frequently repeated charge that the preschool age was the neglected age, at least as far as nutrition was concerned. When we consider, however, that the

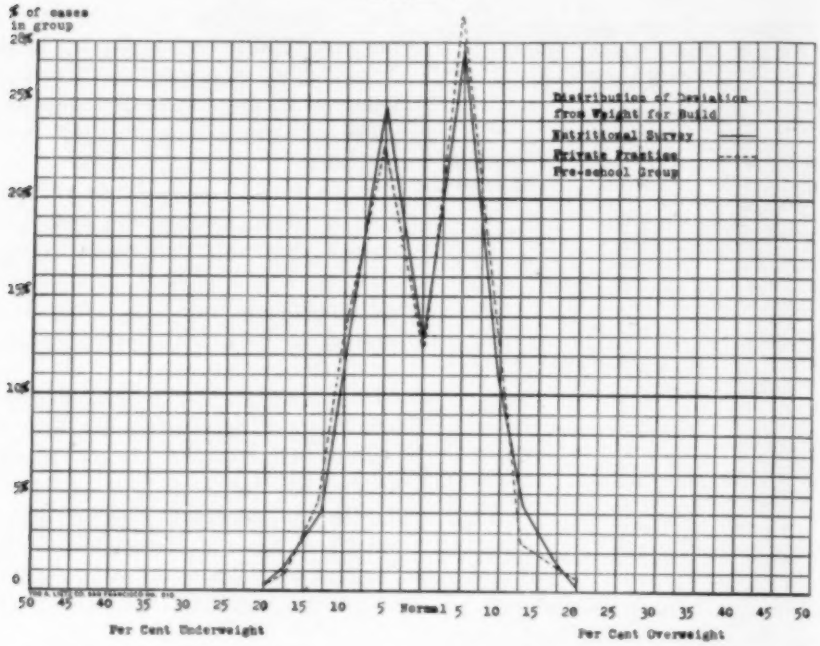
TABLE IV

SAN FRANCISCO DEPARTMENT OF PUBLIC HEALTH NUTRITIONAL SURVEY PROJECT—1934

AGE GROUP 6–16 YEARS

Percentage Group	*Total*	*Percentage of Total*
Overweights		
51–75%	13	0.35
46–50%	5	0.13
41–45%	11	0.30
36–40%	18	0.49
31–35%	46	1.26
26–30%	72	1.97
21–25%	159	4.36
16–20%	264	7.24
11–15%	416	11.41
6–10%	542	14.86
0– 5%	451	12.37
Normal	440	12.07
Underweights		
0– 5%	382	10.48
6–10%	422	11.57
11–15%	276	7.57
16–20%	93	2.55
21–25%	21	0.57
25–30%	11	0.30
30–50%	3	0.08
Total	3,645	

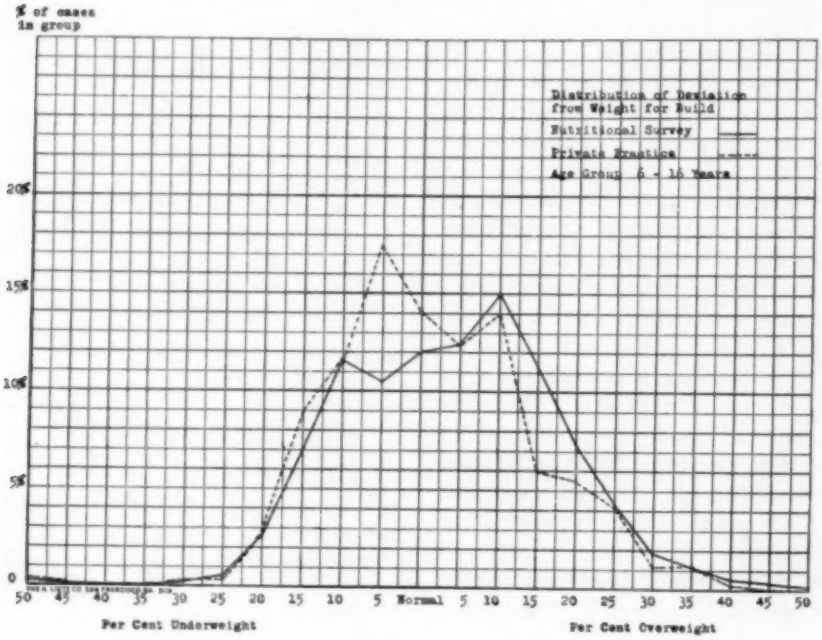
FIGURE V



vast majority of these children were registered in well baby conferences throughout the city the result is not surprising.

Six months ago the families of these children went on cash relief. It would seem highly desirable to repeat this survey, beginning if possible soon after

FIGURE VI


% of cases in group
20%
15%
10%
5%
0
Distribution of Deviation from Weight for Build
Nutritional Survey
Private Practice
Age Group 6 - 16 Years
50 45 40 35 30 25 20 15 10 5 Normal 5 10 15 20 25 30 35 40 45 50
Per Cent Underweight
Per Cent Overweight

the first of September. The comparison of the results of the two examinations would be extremely valuable although the time is perhaps too short to judge adequately the advantages or disadvantages of the cash system. In addition a second examination would afford an opportunity for the comparison of weights in individual children which would undoubtedly be of considerable value in estimating the trend of growth and nutrition of the child.

Other considerations include the follow-up work for correction of remedial defects and the selection of special children whose wide variation from the normal height-weight ratio would single them out for special study.

If for purposes of discussion the length-width index as described is to some degree a measure of nutritional status, it would seem advisable to conduct similar surveys in various parts of the country.

The objection relative to expense raised editorially in the *J.A.M.A.*[3] a year ago is no longer a valid one. With the F.E.R.A. in operation public health officials are continuously besieged to provide work projects for the professional groups. What more profitable way to employ our needy professional brothers and sisters than by securing a cross-section of the physical condition of the children throughout the country? The use of a standard system of measuring is of course advisable for purposes of comparison. The methods used at present to arrive at a diagnosis of malnutrition are almost as numerous as the workers.

Until a more satisfactory standard is developed the simple procedure described is recommended as the one of choice. Its advantage over other methods, in addition to its simplicity, is that it can be used as a basis for weight prediction.

While it is admitted that malnutrition has never been confined to the poor, a survey of relief groups may do much to counteract some of the hysteria and even panic created by well meaning but uninformed self-styled nutritionists by their dismal picture of what was happening to our child population in the depression.

Finally it must always be borne in mind that malnutrition is a symptom and not a clinical entity. Without a well planned follow-up the mere collection of statistics may indeed be called an idle gesture.

SUMMARY

1. A change in the plan of administering relief in San Francisco made it advisable to estimate the nutritional status of the children who had been receiving aid.

2. A length-width index of nutrition was chosen as the method of selection.

3. The technic of conducting the survey is described.

4. A statistical analysis of the findings is presented.

5. Recommendations for a continuation of the study are made.

CONCLUSION

1. The relief program prior to March 1, 1934, was adequate as far as the nutritional status of the children measured by a length-width index, is concerned.

2. The aspect of health education by the physical examination for the discovery of defects was not neglected.

3. There is need for a second and third examination at intervals of 6 months.

4. Similar undertakings would be advisable throughout the country using F.E.R.A. funds.

REFERENCES

1. Franzen, Raymond, and Palmer, G. T. The A.C.H. Index of Nutritional Status. *Child Health Bull.*, 10:26 (Jan.), 1934.

2. Pryor, Helen B., and Stolz, Herbert R. *J. Pediat.*, 3, 4 (Oct. 3), 1933.

3. Editorial, *J.A.M.A.*, 101, 17:1318 (Oct. 21), 1933.

City Health Department Clinics*

Activities of Public Health Nurses in Case Finding and Case Holding in Relation to Syphilis

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CLINICS for the treatment of syphilis abound today, and yet, either there are not enough of them or most of those which do exist are not properly administered. The incidence of syphilis is not appreciably reduced. This presents a definite challenge to health departments to formulate and administer improved programs. Case finding methods should bring in a much larger percentage of early cases for diagnosis, and case holding systems should keep these cases for treatment and observation until they have been symptom free over a long period of time.

The first element of importance perhaps is to eliminate fear and establish confidence. When people have faith and hope and know the source from which help comes, they besiege the giver and have neither to be sought nor held. The newly infected person who has been taught to recognize symptoms and can feel that treatment will be given without stigma, will be more liable to ask for treatment and come for it. Everyone who comes to the clinic is motivated by hope, and most are not only ill but are dwarfed by wounded pride and thwarted ambition. Everyone who leaves the clinic should go out with confidence in its ability to help.

Michael Davis in his book *Clinics, Hospitals and Health Centers* makes the following statement: "The most important element in effective case control is the work done *while the patient is in the clinic,* not the correspondence or even the home visits which come afterward." Good service to the patient in the clinic, particularly at the first visit, is the most important single factor.

The public health nurse has a unique part to play in making a clinic a success. Hoping for results in a syphilis control program, she has acquired an understanding of the disease, its etiology, the modes of transmission, the usual methods of diagnosis and treatment, and the common reactions. She has also cultivated a sensitiveness to individual needs, especially in relation to mental and social complexities and twisted attitudes. Moreover, she has acquainted herself with the social welfare agencies of the community and has some idea where to turn to find assistance in making suitable adjustments that will enable the patient to continue treatment or to protect others. The possession of such qualities enables the public health nurse to perform a superb service as a go-between for clinic and home, physician and patient, the patient and his family, his friends and his employer. Thus equipped, she is

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far too valuable to devote her entire time to determining eligibility, or to routine clerical assistance of such proportions that no time is left available for the very important social and educational measures which should be a part of every clinic.

Within the clinic the nurse makes a contribution to case control by the manner in which she receives patients. The ability to put herself in the patient's place and treat him as she herself would wish to be treated under similiar circumstances, is her most valuable asset. She is interested in the patient as a human being, not as case "No. 768." When she approaches the printed forms intelligently and not in the manner of saying "Just another case," she wins the confidence of the patient. One clinic reports that the giving of false addresses and delinquency in returning for treatment are rare. Another finds just the opposite to be true. Is this not due to the manner in which patients are treated? No individual relishes indifference or haughtiness. It matters greatly to the patient whether he is received by a disinterested registrar who routinely follows a list of questions, or whether he is met by a personality sensitive to his problems. The nurse who can, through carefully directed conversation, obtain all the pertinent facts without direct questioning and without antagonizing and arousing negative reactions, performs an effective part in case control.

Careful history taking is another important contribution which the nurse makes to case control. If the nurse's records contain such phrases as "history of contacts not significant," or if she permits herself to be so dull as not to find one hint of the source of the patient's disease, it is no wonder she is sometimes relegated to less important services such as "pulling" histories and making out appointment slips. Many clinics, however, have learned the economy of correct history taking by a careful nurse. It is an indispensable aid in the discovery of possible cases, and in dealing with cases where special adaptations are indicated; for example, while taking history one day, the nurse observed that the patient fidgeted considerably and that her eyes turned repeatedly toward the clock. She immediately sensed the patient was in a hurry and in response to one sympathetic comment she learned that the woman had left a sick baby at home, that her husband was taking care of it but had to be at work at a given hour which fast approaching, and that the woman had already waited her turn for 2 hours. The nurse then handled the situation so that an exception was made to the usual routine and the woman was seen by the physician and enabled to return home and relieve her husband in time for his work. The nurse noted on record "family responsibilities," which would indicate to any of the clinic personnel that special adaptation was required.

Patients appreciate such individual treatment and when it is received there is seldom any call for coercion. Necessity for coercion should be considered reason for frank acknowledgment of failure on the part of clinic personnel. The patient has understood or has not been understood.

The usual function of the nurse, as interpreter to the patient the specialist's findings, renders her of utmost value in case control. Every patient will respond to a clear explanation of his particular case and with more enthusiastic coöperation. The nurse realizes that no two cases are ever exactly alike and recognizes the need, as interpreter, to connect the physician's findings with facts in the patient's own environment that his interests and attitudes may be sufficiently stirred to motivate coöperation.

Every person who has been success-

fully treated for syphilis should be urged to become a teacher in the campaign for prevention and cure of the disease. In some clinics a nurse regularly conducts a lecture to a waiting group. This appears to be a valuable method of case holding. Patients who think they are cured after a few injections, or after 1 negative Wassermann, or when they feel "perfectly well," ordinarily become delinquent. By clarifying and explaining why these are not good reasons for discontinuing treatment, the nurse holds many of these cases without lapses. The lecture period makes clearer to patients the urgency of reporting promptly anything which is troubling them in relation to treatment —a painful injection, an unexpected reaction, or any social circumstances which make clinic attendance difficult.

The nurse tries to excite an emotional reaction against the present state of affairs and a hope of something better. She presents a truthful picture of the tragic effects of untreated syphilis and tries to inspire each patient with a sense of responsibility, not only to himself, but to his family, and to the community who have to bear the suffering of congenital syphilis or the miserable effects of late lues. She also explains, in simple language, the ways in which syphilis is transmitted, the necessary concurrent disinfection, and the hygienic measures the patient should adopt to protect others, and urgently emphasizes the necessity of immediate observation and careful examination of all contacts.

The nurse often makes herself valuable as an educator in other ways within the clinic. She endeavors to guide all the patient's experiences within the clinic, so that they may favorably influence "his habits, his attitudes and knowledge" in relation to the prevention of syphilis. She tries to have the waiting and examining rooms arranged and managed in accordance with hygienic values. She tries to do away with unnecessary massing of patients in one crowded waiting room for long hours of waiting. She takes an interest in the decoration of walls and the supply of pamphlets and pictures of an educational nature.

An elderly patient who had just been employed, after 2 years without any job, came to a clinic one day at noon, hoping to have an early chance for treatment. A large group was already waiting. The old gentleman waited until it was almost 2 o'clock and then when he explained to an attendant that his new job demanded that he be on duty at 3 o'clock. "Have to wait your turn," snapped the attendant, and a few weeks later the public health nurse had to hunt up another delinquent. As one discordant instrument in the orchestra ruins the symphony so one member of the clinic staff who is not in harmony with the ideals of individualization for case holding spoils the work already done by others.

Most clinics waste too much of the patient's time. Various adaptations of the appointment system have largely overcome the long periods of waiting. Still when carfare and absence from work require deprivations of a sort, clinic appointments should be carefully gauged. The nurse has an important part to play in emphasizing courtesy and individualization of the patient.

Well regulated clinics find some sort of efficient follow-up system indispensable, not only for case holding in a few instances, but for case finding among contacts of a syphilitic patient. Here again, the public health nurse functions. She visits homes and, with understanding and tact, makes an approach which leads patients, new and old, to the clinic doors. If the nurse serves periodically within the clinic in close coöperation with the physician she finds familiarity with present-day procedures a distinct advantage outside the clinic. It makes her more adept in

case finding and in handling the perplexities of patients, especially in relation to misunderstood instructions. She helps to make social adjustments. Frequently she is called upon to clarify a patient's position in relation to his employer, and thus wins the patient's gratitude and renewed will to coöperate by helping him to hold a job from which an employer, untutored in the communicability of the disease, had unwisely expected to "fire" him.

The public health nurse, in the field, seeks to stimulate interest in routine Wassermanns on all prenatal cases; supervises the new-born babes of syphilitic women. She realizes that public information regarding syphilis is woefully lacking and tries to develop a sane, unemotional attitude toward it. Some years ago families tried to hide tuberculosis if it existed in their midst and thereby failed to take proper measures for its control in fear of an imagined stigma. What marvelous progress in change of attitude was indicated when several years ago, the newspapers of the country broadcast that a son of the President of the United States was found to be a victim of early tuberculosis and was to receive prompt treatment in a mountain rest home! Such publicity might never be desirable in relation to syphilis, but surely it is obvious that a change of attitude in regard to it must continue.

It has been estimated that about 10 per cent of syphilitics contract their infection in an innocent way. It is well also to recall the words of Dr. John Stokes, who writes that "no genealogic tree is so pure that syphilis has not twined itself among its branches." The nurse who carries into the homes a calm, scientific attitude toward this disease helps to bring about the revelation of many new cases.

Every case found, carefully studied for the identification of his intimate contacts, is a means of prevention and eradication of the disease. The follow-up depends for its success upon a very thoughtful method of approach. In this connection Dr. Nels A. Nelson writes as follows:

> The search for "sources of infection" requires understanding. It is unfortunate that the term "source of infection" ever came into use in this connection. It is the most antagonistic approach that could possibly be made. A person who is accused of having infected another is quite naturally on the defensive. It is a perfectly understandable reaction. It is often an unjust accusation. The patient, on being questioned as to his exposures, naturally thinks of the last one. The incubation period is long enough and variable enough so that his contacts during that period may have been many. The last partner may have been exposed to his infection rather than have been the cause of it. Or the patient may have an acute recurrence of an old neglected infection which he mistakes for a new one. All of his recent contacts may then be victims of the patient's infection.
>
> It is always safest to approach a contact, whether or not the alleged source of an infection, as the possible victim of an infection. Certainly every "source of infection" must, at some time previously, have been the victim of another infection. The person thus approached is concerned in his or her own interest as the offended party. As there is no need for defense against accusation, the advice to seek medical attention is more readily accepted. It is better to think always in terms of case-finding than in the uncertain and often unjust term of search for the "source of infection."

CONCLUSION

In spite of the large number of syphilis clinics in the United States there are very few localities where a well rounded piece of work is being carried on. There is need, in general, for less secrecy and a more scientific attitude toward this very prevalent disease, and in particular there should be greater individualization of cases. Each case is a potential teacher, each case a pivotal point for the location and eradication of many other cases.

Success of the most efficient medical treatment rests upon a well rounded

supporting service, in which every member of the staff shall be imbued with the ideal of complete eradication of syphilis, that the ever present danger in any institution of letting it degenerate into a machine shall be obviated. The Master has told us that " not a sparrow falleth " without the Creator's attention. When such is the spirit of the clinic its service to humanity in the eradication of human misery due to disease will have manifoldly increased.

Campaign Against Diabetes

ORGANIZED work against diabetes in New York City has begun with the formation of the New York Diabetes Association, affiliated with the New York Tuberculosis and Health Association, and to be associated with it at its headquarters, 386 Fourth Avenue, New York, it has been announced.

The formation of the service on diabetes was made possible through a special contribution of $15,000, given by Lucius N. Littauer, toward the first three years' work.

In presenting his subscription, Mr. Littauer expressed the hope that the establishment of this work against diabetes would lead to the control and possibly the reduction of the growing mortality from the disease, and stressed the fact that the coördination of activities in the fields of both tuberculosis and diabetes would result in mutual benefit to sufferers from these diseases, as diabetes greatly aggravates the condition of tuberculous patients.

Commenting upon the formation of the new association, Dr. Charles F. Bolduan, of the Department of Health of the City of New York, pointed out that the registered deaths from diabetes in New York City have increased since 1923, when there were only 1,360, to 2,141 during 1933—a figure which puts the disease here among the leading causes of death. Twice as many women as men die of diabetes, he added; last year there were 1,418 of the former and 723 of the latter.

The New York Diabetes Association proposes to act as a clearing house for the study of the disease as a health problem and to devise measures for its control; to assist in the formation of an association of clinics dealing with diabetes; to develop graduate courses of instruction for physicians; particularly to carry on health education of the general public in all matters pertaining to the disease; and to obtain the provision of insulin for indigent diabetics, and nursing service and hospitalization for all requiring it.

The association plans to operate in a city-wide basis under the leadership of noted physicians in the diabetic and metabolic fields, and to include in its council representatives of the tuberculosis and health associations, members of the New York Academy of Medicine, of the Departments of Health and Hospitals of the City of New York, of the county medical societies, of schools of medicine; public and private hospital authorities; representatives of social and welfare agencies, and interested laymen.

Nutrition and Health and the Price of Milk*

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DAIRYING has long been recognized in this country as a basic industry, the proper conduct of which is essential to our national progress, welfare, and prosperity. Milk is, in fact, the most important agricultural commodity in the United States. This prominence is due not merely to the fact that milk and milk products from American farms constitute our greatest single source of agricultural income, but because the regular consumption, by all of the people, of more liberal amounts of pure milk and dairy products unquestionably would be an important factor in the improvement of national vitality.

This desirable increase in the consumption of clean and safe milk and its many products is, therefore, a matter of both economic and biologic significance. Biology and economics are factors that are closely interwoven in the whole science and art of public health, particularly in matters relating to human nutrition. If we could solve the intricate problems of supply and demand, of costs and prices, of reasonable regulation, and of better public appreciation of dairy products, we should contribute immeasurably to human welfare, both with respect to national prosperity and public health.

MILK CONSUMPTION AND THE PUBLIC HEALTH

Despite the fact that modern science has demonstrated in a long series of brilliant investigations that milk is indispensable to adequate human nutrition, and that the dietary qualities of dairy products surpass those of practically all other foods, the average American consumes too little milk. In 1933, the annual per capita consumption of fluid milk and cream was only 38.8 gallons, or 0.85 pint, a day. Sectionally, some parts of the United States are much worse off in this respect than are others. In the South Atlantic and South Central states, the daily average is only about ⅔ pint a day, whereas in the North Atlantic states, nearly 1 pint of milk was taken by each person every day. In the Western and North Central states the daily quantity of milk consumed was about the same as the average for the whole country.

Our per capita milk consumption is now about where it was a decade ago. Up to 1929 it was steadily rising, the annual increase being due in all probability to improvement in the sanitary quality of market milk supplies, greater public confidence in the safety of milk, more extensive knowledge of its nutritional benefits, and greater purchasing

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power in those relatively prosperous times. Since 1929 there has been a consistent decrease from a per capita of 40.8 gallons in 1929 to 38.8 gallons, or a reduction of about 5 per cent. Until the coming of the drought, there had not been an accompanying decrease in production, which is one of the several reasons why we have a milk problem.

Scientists who have worked out the mass food requirements of the American people on a careful nutritional basis declare that even in a restricted diet for emergency use, 155 quarts, or 38.75 gallons, of milk are necessary for each person in the course of a year. Today our people are, therefore, barely living on a restricted and meager milk diet. For an adequate diet at minimum cost, not less than 260 quarts, or 65 gallons, of milk or its equivalent in other dairy products is advised. For an adequate diet at moderate cost, or for a liberal diet, the per capita figure is set at 305 quarts, or 76.25 gallons of milk annually.[1]

From these authoritative data, it is obvious that milk production and consumption in the United States ought to be increased by about 70 per cent. In theory, an increase in milk production, from the present 3,269,470,000 gallons annually to more than 6,000,000,000 gallons, is economically and biologically sound. The difficulty is an impassive public, not yet wholly convinced that pure milk is what it is, an economical and inexpensive food of unique dietetic properties.

MASS STUDIES ON THE VALUE OF MILK CONSUMPTION

The people of the United States, living under an aura of scientific progress, are, strangely enough, much less addicted to the use of dairy products than are the citizens of many other nations. Our per capita consumption of whole milk has always been exceeded by that in Finland, Switzerland, Norway, Canada, and the Netherlands.[2] The consumption of butter is far greater in New Zealand, Canada, Australia, and the Netherlands than in our country, where butter is so abundant. In the use of cheese, we rank 12th, our consumption of this nutritious and savory product being less than half that of the peoples of 9 other nations. It may be more than a mere coincidence that the general death rates are lowest, the duration of life is longest, and the people are most rugged, in countries where the consumption of sanitary dairy products is greatest.

The favorable influence on healthful longevity of the regular consumption of optimum amounts of pure milk is now as well established as is the unfavorable effect on infant and general mortality of impure and contaminated raw milk. Proof has come from the laboratory that milk consumption is conducive to life prolongation.[3] If, however, statistical data for entire nations have not yet been adduced to confirm this fact, other interesting scientific experiments have demonstrated the value of increasing the use of milk in large populations. Two of these studies are worthy of special mention.

The most noteworthy and most extensive investigation on milk was conducted in Scotland.[4] Between 1927 and 1930, nearly 25,000 school children participated in 3 separate tests to determine whether supplementary daily feedings of raw or pasteurized milk would influence physical growth. In the first test, involving 1,282 children over a period of 7 months, the milk-fed group showed an increase of weight and height 20 per cent in excess of those who were not favored with this extra milk. In the second test, which included 1,157 children, the milk groups increased their heights 23.5 per cent more than the controls, and gained 45.4 per cent more in weight.

For the third test, no less than 20,000

children were selected in the schools of Lanarkshire. In the course of 4 months, one-half of these Scotch children were given ¾ pint of tuberculin tested milk every day. Raw milk was given to 5,000, and pasteurized milk to 5,000. The results confirmed the previous experiments, showing conclusively that milk makes a notable difference in the physical development of young children. During the comparatively short period of this test, the milk-fed group gained on the average from 4 to 6 ounces more in weight than the controls. Another feature worth noting was that there were no measurable differences in the effects of raw and pasteurized milk. Recently a careful statistical analysis of the data, made by dividing the children into identical pairs, was carried out in the laboratory of Professor Karl Pearson.[5] The observation that children who have extra milk gain in height and weight over those who do not was confirmed, as was also the fact that pasteurized milk is as efficacious as raw milk for this commendable purpose.

A law passed in 1930 in Scotland empowers local authorities to supply graded milk to school children, a policy deserving of emulation in our own country. "It is expected," says an editorial in the London *Lancet*,[6] "that this power will be widely used in the near future and will result in a noticeable improvement in the physique of the Scottish race."

The definite influence of milk consumption on the physique and general health of a race has been shown by another recent study, conducted by British medical officers in Africa.[7] Examination of the members of two neighboring tribes in Kenya revealed that the full-grown male of one tribe, the Masai, was on the average 5 inches taller, 23 pounds heavier, and had 50 per cent greater muscular strength than the adult male of the other tribe, euphoniously known as the Akikuyu. Marked difference was also found in the incidence of disease in the two tribes, bony deformities, dental caries, anemia, pulmonary maladies, and tropical ulcer being more prevalent among the physically smaller Akikuyu.

When the physicians sought for a reason for these differences, they discovered that the diet of the stalwart Masai consisted mainly of milk, meat, and raw blood, whereas the sustenance of the puny Akikuyu was derived from cereals, roots, and fruits. In other words, a milk and meat diet makes strong men with powerful physiques, and a strictly vegetarian fare produces weaklings. This fact has been noted before in the course of human history, for the conquerors have always been owners and users of cows, and not eaters of grasses and grains. The victors have been victorious on diets of calcium and protein, and not on carbohydrates.

FACTORS INFLUENCING MILK CONSUMPTION

Granted that these two examples, selected from the many scientific investigations on milk that could be cited,[8] offer persuasive and cogent reasons for augmenting the national consumption of pure milk, the question arises as to what factors must be considered in attempting to bring about an increase of the use of milk in the United States. Certainly, the milk companies and the various national organizations supported by them have been endeavoring to perform this praiseworthy task, and in doing so, have always had the active coöperation of federal, state, and local health and agricultural officials.

The primary factors affecting milk consumption are: (1) the availability of milk, (2) the quality of milk, (3) the cost of milk, (4) the wisdom and knowledge of the public, and (5) the purchasing power of the consumer.

Milk of good quality is now generally available in all parts of this country, although the quality is, on the whole, much better in the larger cities than in the rural sections. This improvement has been due in part to a gratifying increase in the amount of pasteurized milk—some 88 per cent of all our market milk now being pasteurized, if the possibly rather optimistic estimate of the U. S. Public Health Service is correct. In the few regions where fluid milk is unobtainable, or in those places where its purity may still be questionable, the public can always obtain the concentrated milks, including evaporated, powdered, and condensed. These processed milks exhibit virtually the same nutritional properties as pasteurized milk, and they are clean, safe, and in some instances, sterile.

The knowledge of the public regarding milk is one of the outstanding factors affecting its consumption. Better education of the people as to the merits of milk tends to bring about gratifying retention of milk and dairy products in the diet, even in times of depression, a phenomenon which was emphasized by Dr. A. Gorini of the International Labour Office in an address at the recent World's Dairy Congress in Rome (April 30–May 6, 1934). He called attention to studies in Belgium and Germany which revealed that increases in the purchasing power of the worker invariably resulted in greater uses of milk and dairy products, with corresponding decrease in the use of the less nutritious cereals and potatoes. This observation is not novel, but is the basis of one of the dogmas of economics.

Education can, however, often alter erroneous sociological principles, a fact which is beginning to percolate even into the consciousness of the sovereign power. The Legislature of the State of New York recently appropriated half a million dollars to advertise the estimable qualities of milk as food. This campaign, which is now in progress, is financed by levying a tax of 1 cent per 100 pounds of milk and cream sold in fluid form, half of the amount to come from producers and half from distributors. As usual, the industry pays, and it would seem more logical if this worthwhile campaign were conducted by the industry itself, rather than by the state, which should, nevertheless, lend the weight of its authority to the support of it. Milk is not a public utility, according to a recent decision of the United States Supreme Court,[9] although the milk industry is subject to reasonable regulation in the public interest.

Milk is not a public utility, nor is it a luxury. If all the people could be made acutely cognizant of the economy and the necessity of milk consumption, and aware of the fact that money devoted to the purchase of milk produces a substantial return on the investment, there would be much less agitation and misconception regarding the alleged high cost of milk.

FACTORS AFFECTING THE PRICE OF MILK

As with every industrial commodity, the price of milk is governed to a considerable degree by supply and demand. Theoretically, the present supply of milk in this country is only a little more than half what it should be in order to meet the health requirements of the nation, but actually the demand is less than the supply.

One of the causes of this unhealthy state of affairs has been a great expansion of the dairy industry in recent years, an expansion which ran full tilt into the economic depression. Between 1929 and 1933 there was an increase of 14 per cent in the number of dairy cattle in this country, or a rise from some 21,000,000 cows to about 26,000,000. Experience has shown that increases in the cow population occur in cycles of about 15 years each, 7

up and 7 or 8 down, and that we are now at the peak of one of these cycles. Aside from this bovine cycle, however, there has also been a steady increase in the number of dairy cattle, due to human population increases and other biological factors.

Although the demand for milk has not kept pace with the supply since 1929, the decrease in milk consumption has been less marked than in the case of many other products affected by the depression, even, in some instances, where prices were drastically reduced. This provocative fact may afford us some comfort.

The price of milk declined with the depression, but not to the same extent as some other dairy products, such as butter and evaporated milk. If the decline in the price of fluid milk had been too drastic, the depression might have been accentuated, because the leading cost factor in the milk industry is labor. The maintenance of the wage scale is obviously a matter of great economic and sociologic significance.

Two-thirds of the retail price paid for a bottle of milk is devoted to the compensation of labor, including that of the farmer, although the expenses of the farmer also include feed and other supplies. In New York City, for example, the average retail price paid by the customers of the largest milk company in 1933 for all grades of milk was 9.1 cents a quart. Of this, 4 cents went to the farmer or his agent, the coöperative, and 2⅜ cents was paid for labor, including the personnel at country milk plants, at pasteurizing and bottling plants, in laboratories and offices, the delivery and sales staff, and the veterinarians and inspectors. Adequate sanitary supervision adds, of course, to the cost of milk, but is worth it.

Of the remaining one-third of this average retail price, 1 5/9 cents was spent on materials, such as bottles, cases, and cans, on coal and gasoline, on feed and bedding for horses, and their replacement, on the maintenance and wear and tear of vehicles, and of dairy plants and their equipment. Another ⅞ cent went for railroad and motor transportation. Advertising received only 1/16 cent, taxes 1/9 cent, and officers' salaries only 1/50 cent. Although the big milk companies have been accused of paying enormous salaries to their executives, the largest companies actually have lower costs for this purpose per quart of milk than the small companies.

After all these necessary expenses have been met, the little that remains is profit. In the case outlined, this amounted to about ⅛ cent on each quart of milk sold, which went to thousands of individual stockholders, who put this money back into circulation. Studies of the profits of 19 milk dealers in New York City, including the 5 largest companies, reveal that in August, 1933, they had to sell 143 quarts of milk in order to make 1 cent profit.[10] In 1934, under the exacting requirements of the N.R.A., the A.A.A., and the rest of the federal alphabetical gamut, many of the milk companies were operating at a loss. No one but a moron or an agitator could claim that profits such as these are excessive, although there are plenty of persons in both of these categories, some of them in high places, who do say so.

THE ECONOMY OF MILK AS A FOOD

Despite the fact that the most sapient authorities on nutrition, including government officials, professors, and other pundits, universally advocate the expenditure of from one-fifth to one-third of the family food budget on milk, the actual expenditure for this indispensable food is now only about one-tenth of the average American food budget. The fraction now allotted to milk could be doubled without increasing the daily

expenditure for food. Departure from a false and penurious policy regarding the purchase of milk would, moreover, more than double the nutritional value of the diet, and would also react favorably upon our dejected dairy industry.

The true economy of milk can be demonstrated by comparing the costs of its nutritional constituents, its fat and carbohydrate, its proteins and minerals, and its vitamins, with other staple foods. The comparison will be found favorable to milk, the average retail price of which in this country is now about 11 cents a quart, or approximately 5 cents a pound, or 1⅔ cents per 100 calories provided for the proper functioning of the human machine.

Pound for pound, milk is cheaper than all other foods, except one or two of the vegetables, but this basis of comparison is not, of course, strictly fair. In 100 calory portions milk is less expensive than many foods, and it is, therefore, a relatively inexpensive source of energy. Most meats, for example, exceed 3 cents per 100 calories, in contrast to milk at 1⅔ cents. Fruits and many vegetables bought in cities will cost from 3 to 20 cents per 100 calories. Breads, cereals, potatoes, and a few other vegetables are cheaper than milk as sources of energy, but fuel is about all that some of these foods provide, whereas milk gives much more than that. Calories are only a part of the story.

As a source of protein, milk is cheap, and cheese is even cheaper. The cost of 100 protein calories from cheese is, in fact, less than half the cost of the same number in beef, and only a third that of eggs. If we could put a price on calcium and phosphorus, the minerals requisite for strong bones and teeth, we would find that milk is exceptionally cheap. It is the best dietary source of these necessary minerals and it yields the daily gram for a price far below any other food. An equivalent amount of calcium from lean beef, for example, would cost the consumer 100 times as much as from milk. Securing calcium from spinach costs 3½ times as much as from milk.

The vitamins in milk are worth money. Since, however, it is difficult to assign financial values to them, the vitamins may be considered, as Rose has suggested,[11] as profits on the investment in milk. Consumers pay fancy prices for cod liver oil, which contains vitamins A and D, and yet whole milk provides an adequate supply of vitamin A, and 1 quart of irradiated milk not only furnishes as much vitamin D as 3 teaspoonfuls of cod liver oil, but is more effective as an antirachitic, according to authoritative clinical studies.

All factors considered, milk at its present price, or at double that price, is an economical food, worth not 11 cents but nutritionally at least 18 cents a quart. The daily quart needed by every growing child, every expectant and nursing mother, and every undernourished person, and the daily pint for every other adult, is health insurance at a very reasonable cost. The quickest way that the cost of distribution of milk could be appreciably lowered is by a material increase in the national demand for our most nearly perfect food. Such an increase should be the goal of every progressive health official, who, while alert to safeguard the cleanliness and safety of the milk supply of his community, owes an equal duty to the public health to promote the greater consumption of pure, pasteurized milk and of the other salubrious dairy products. The solution of the dairy industry's present plight is not a decrease in production, but an increase in consumption.

SUMMARY

Although milk is recognized as our most important food, the consumption in this country is now far below the

acknowledged standards of an adequate diet at a reasonable cost for all the people. The consumption of milk in the United States should be increased at least 70 per cent.

Mass studies on milk consumption in various parts of the world have demonstrated the beneficial effects of higher milk consumption upon physical welfare.

The consumption of milk is influenced by such factors as the availability of clean and safe milk, the cost of milk, the purchasing power of the people, and the education and understanding of the public as to the unique value of milk in human nutrition.

The price of milk is affected by such factors as supply and demand, the demand not having kept pace with the supply in recent years, and the costs of human labor, which has been maintained at a high level during the depression.

The spread between the price paid to the farmer and that paid by the consumer is due to necessary costs and is not represented by profits to the distributor. The actual profit on each quart of milk sold generally does not exceed a very small fraction of a cent.

At its present price, or at double that price, milk is or would be an economical food, giving a better return on the nutritional investment than any other food, or many combinations of foods.

The solution of the economic problem of the dairy industry is not through a decrease in production, but by an increase in consumption of milk and dairy products, an endeavor which deserves the active coöperation and assistance of all public health officials.

REFERENCES

1. Stiebling, H. K. A statistical analysis of the food requirements for the population of the United States. *J. Am. Statis. Assn.*, XXIX:186 (Mar.), 1934, Supp.

2. U. S. Dept. of Agric. *A Handbook of Dairy Statistics*, 1933.

3. Sherman, H. C. *Chemistry of Food and Nutrition* (4th ed.), 1932.

4. Leighton, G., and McKinley, P. L. *Milk consumption and the growth of school children.* Dept. of Health for Scotland. 1930.

5. Elderton, E. M. The Lanarkshire milk experiment. *Ann. Eugen.*, V:326 (Oct.), 1933.

6. Editorial. Milk and the growth of children. *Lancet*, Jan. 17, 1931, p. 145.

7. Orr, J. B., and Gilks, J. L. The physique and health of two African tribes. *Med. Res. Counc. Spec. Rept. Series No. 155.* Gt. Brit., 1931.

8. Crumbine, S. J., and Tobey, J. A. *The Most Nearly Perfect Food*, 1929; Tobey, J. A. *Milk. The Indispensable Food*, 1933.

9. Nebbia v. New York (1934), 291 U. S. 502, 78 L. Ed. 563, 54 S. Ct. 505, 89 A. L. R. 1469. See Edit.: State control of milk prices. *A.J.P.H.*, Apr., 1934.

10. Spencer, L. *Dairymen's League News*, Apr. 24, 1934. Also: *Report of the Joint Legislative Committee to Investigate the Milk Industry*, New York. Leg. Doc. No. 114. 1933.

11. Rose, M. S. *Feeding the Family* (3rd ed.), 1929.

DISCUSSION

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IN this discussion perhaps it would be best as a health officer that the discussion be confined to the aspects of wholesomeness and safety of milk.

Milk as a food and beverage was generally used among the ancients. Certainly, butter was used in India as early as 2000 B.C. Milk has a unique position in our dietary in that it is more universally used than any other food commodity. As such, it has a most profound influence on the health of the people. It contains all the food elements, namely, fats, protein, carbohydrates, mineral salts, and vitamins. Therefore, as a so-called well balanced ration it stands supreme. If one desires to state it popularly, it has sugars and fat to warm you and to make you plump but not over-plump, protein to

give you strength, mineral to build your bones, and vitamins to stimulate growth.

In the United States, the production of milk has increased enormously. Likewise, the sanitary measures to protect its safety as a food have increased. The price to the ultimate consumer, however, for many economic reasons, has remained stable. It may be stated without fear of contradiction that making milk a political holiday has become unpopular and today we have the intelligent coöperation of the modern health officer, the producer, and the distributor.

There could be considered adverse and scientific periods in the production and sale of milk. Among these so-called periods was that of dilution with water, preservation with chemicals, tuberculosis, certification, pasteurization, and last but not least, abortion and Malta fever. Perhaps the most important periods are certification and pasteurization. The problem of tuberculosis apparently is being met, but the problem of abortion and Malta fever is at present obscured in a mass of detail that needs intelligent unraveling in order that practical preventive measures can be adopted.

One of the really important services to be rendered in conserving public health of any community is the provision of a safe milk supply. Such a supply will earn its dividend in a general low death rate, but particularly to be noted, in the death rate under 2 years. Moreover, a safe milk supply is a community advertisement to be stressed. Milk taken from healthy cows under sanitary conditions is usually comparatively free of germs. Unfortunately milk so produced is too often the exception rather than the rule. Therefore, dairy sanitation should begin at the source, the dairy farm.

Contamination with germs ordinarily begins with the act of milking and the route to the consumer is fraught with possibilities of contamination which are many and varied and often dangerous. Consequently, proper pasteurization is a necessary requirement for the general milk supply. Pasteurization properly done never was intended to atone for lax sanitary methods. Neither should it give the dairyman a false sense of security in not maintaining a healthy dairy herd. As policy, all milk should come from healthy cattle. Again, each distributing district or area or city should maintain routine inspection of the dairy farms along with the inspection in the district receiving and pasteurizing stations and at the city railroad platforms in direct shipments. These examinations would consist of sediment, chemical and temperature tests, as well as those for color, odor, taste, and of the containers.

The health officer is actively concerned with safeguarding the supply against such infections as tuberculosis, typhoid fever, diphtheria, scarlet fever and septic sore throat. Pasteurization is greatly depended upon to do this. Another factor of safety can be added by not permitting milk to be distributed from farms where there exists a contagious disease, and the same rule applies to employees of pasteurizing plants. In fact, it is considered good practice to submit such employees to routine physical and laboratory examinations and to immunize them against certain communicable diseases.

The production of certified milk practically dates back some 30 years and should be the only raw milk permitted to be distributed. Tuberculin and possibly abortion tests of the herd and of any additions should be required semi-annually. The health officer should have such test records on file. Monthly physical examinations should be made of the dairy attendants along with such laboratory examinations as are considered necessary with immunization

against certain communicable diseases.

Pasteurization should be required for all milk, except that which is certified, sold in any city. There is no doubt that the merits of this process in safeguarding public health against milk-borne infection are thoroughly recognized. Pasteurization consists of heating milk to a temperature of not less than 145° F. and keeping it at that temperature for not less than 30 minutes. We cannot too strongly emphasize, however, that this process is not a substitute for sanitation or as a corrective for milk from diseased cattle. It must also be recognized that the control of proper pasteurization is to a great extent dependent upon the human element. The possibility of some mechanical defect is manifest and careful survey and continuous inspection of pasteurization plants are essential.

The Director of Public Health of San Francisco wishes to record the fact that he disapproves the present tendency of manufacturers to add measured quantities of vitamins to foods for commercial purposes. The insufficient and incomplete scientific knowledge available at this time on the possible effects of the consumption of vitamin reinforced food products over indefinite periods fully justifies the attitude that caution should be observed in the use of such products. There is still considerable question, particularly concerning vitamin D, of what constitutes the proper dosage of vitamin concentrates in the various age groups. Any attempt to increase the sale of a food product, especially milk, by the addition of a substance whose value to the public health is still a controversial matter is indeed ill advised, since the final evidence, to be determined by research, has not yet been secured. Even if it is granted that the actual danger in the consumption of vitamin D milk is relatively minimal, there is as yet no definite and accepted information on the limits or margins of clinical safety. Under these circumstances it is believed that the administration of such products should be surely in the province of the physician and not in that of the commercial distributor or manufacturer of food products.

Medical Care in the United States

HOW are we situated in regard to the so-called services? About every fifth bed in hospitals (except those for mental cases) is vacant, while at the same time only half the people who need hospitalization can either get it in "charity" wards or buy it. A large percentage of our doctors and nurses are idle, while sick men everywhere are dying without receiving medical attention.

As a nation we spend $3,250,000,000 for health, or $26 per capita, whereas we should be spending $42. In consequence, the death rate is in inverse proportion to income—the unskilled, poorly paid workers die at the rate of 1,440 per 100,000, while the skilled workers die at a lower rate of 829 per 100,000; managers and officials at 793, and professional people at the rate of 670.—*The New Republic*, Dec. 12, 1934.

MODERN VAULT TOILET FOR LABOR CAMP USE

THOMAS M. EDWARDS AND THOMAS E. PRING
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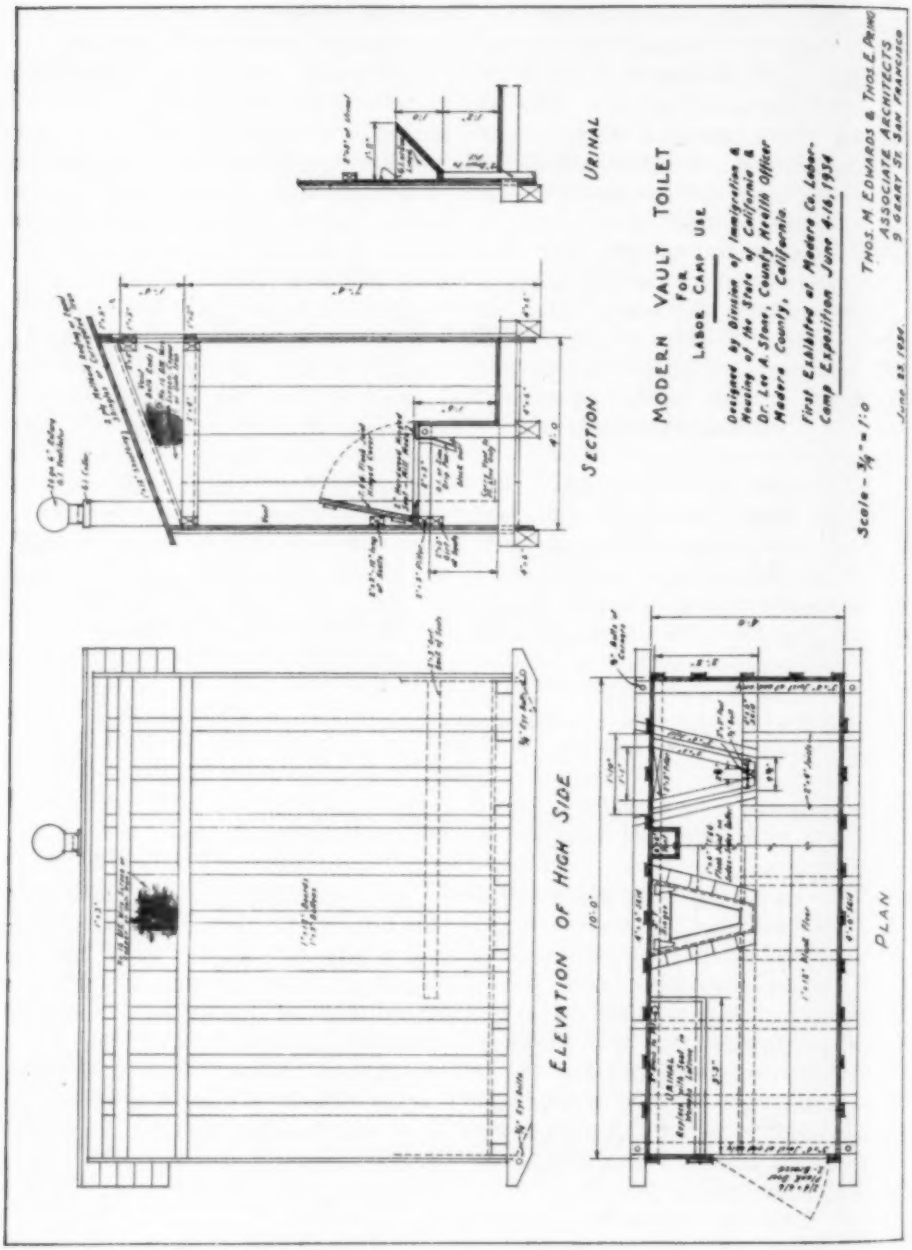
URINAL
SECTION
MODERN VAULT TOILET
FOR
LABOR CAMP USE
Designed by Division of Immigration & Housing of the State of California & Dr. Leo A. Stone, County Health Officer Madera County, California
First Exhibited at Madera Co. Labor Camp Exposition June 4-10, 1934
Scale - 3/4" = 1'-0
THOS. M. EDWARDS & THOS E. PRING
ASSOCIATE ARCHITECTS
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June 23, 1934
ELEVATION OF HIGH SIDE
PLAN

Pipettes for Use in Routine Sterility Tests

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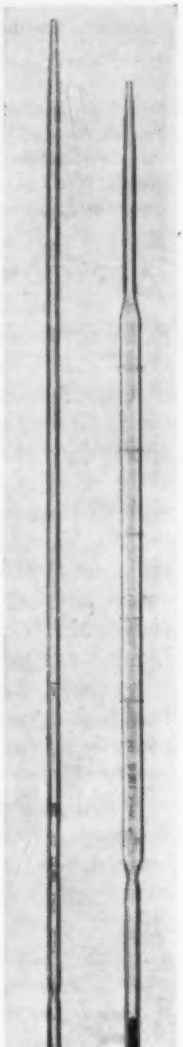
THE pipettes described in this note are designed to facilitate the routine sterility testing of biologic products done in accordance with the regulations of the National Institute of Health. The pipettes have been in use for over a year, and have proved valuable not only in speeding up the actual testing, but in saving both time and material in the washing and sterilizing of glassware. They have an additional advantage in that the inoculation of fermentation tubes with the material to be tested is uniformly accurate.

The National Institute of Health regulations require that products whose human dose is 1 c.c. or less should be tested by the addition of 5 drops to one, and 20 drops to another of two fermentation tubes from each container tested. This requires a pipette graduated at 1 c.c. and 1.25 c.c. The regulations require further that products whose human dose is more than 1 c.c. be tested by the addition of 20 drops to each of successive fermentation tubes until the full human dose has been inoculated. If the human dose is 5 c.c. or more, only five fermentation tubes are inoculated with 20 drops each from every container tested. To meet these requirements, the pipettes described below and shown in Plate I were devised.

It was decided that a satisfactory pipette would have to meet the following requirements:

1. It should be free flowing. Too slow a delivery needlessly slows up the testing procedure. A minimum inside diameter of 1 m.m. was specified since the flow through a 1 mm. lumen was found to be satisfactory.
2. The pipette must be easy to insert through the neck of any final container to be tested and it must be possible to insert it far enough to reach the bottom of the container. For this reason a maximum outside diameter of 4.8 mm. for a distance of 75 mm. from the delivery tip was specified.
3. The pipette must not be awkward to handle. A maximum over-all length of 350 mm. was specified since a longer pipette was found to be unwieldy.
4. The pipette must be easy to read. In order to facilitate reading, all graduations were made in a complete circle about the pipette. A distance of 100 mm. from the plugged end of the pipette to the top graduation was specified so that the pipette could be held comfortably without the fingers obscuring the graduation.
5. The pipette should be easy to plug and there should be no danger of the plug sucking down into the liquid under test. An inside diameter of 6 mm. was specified for the mouth piece and a constriction to an



inside diameter of 1.5 mm. made at least 5 mm. from the mouth piece end. This gives room for a good sized plug and obviates any danger of its slipping down into the pipette.

6. The pipette should be made of resistant glass in order to reduce breakage.

The complete specifications are as follows:

5 c.c. pipette—graduated in c.c. to tip—length from delivery end of bulb—75 mm.
Length from bulb to tip—75 mm.
Overall length approx.—350 mm.
O.D. (except bulb)—4.8 mm.
Lumen, mouth piece—6 mm.
Lumen, del. end, not under 1 mm.
Constriction—1.5 mm. I.D. above bulb
Graduations—in 1 c.c. to tip, complete circles

1.25 c.c. pipette—Distance from plugged end of pipette to beginning of graduation—100 mm.
Constriction—5 mm. from plugged end to about 1.5 mm.
O.D.—4.8 mm. maximum
Diameter of lumen, del. end—not under 1 mm.
Graduations—at 1.25 c.c. and 1.0 c.c. points only—complete circles
Resistance glass

Emergency Nursery Schools

APPROXIMATELY 50,000 children are enrolled in the 1,600 emergency nursery schools which exist under the F.E.R.A. in 47 states, the District of Columbia, and Puerto Rico, according to Grace Langdon, Ph.D., Specialist, Emergency Nursery Schools. Through these nursery schools young children and their parents have derived many benefits since the time of their authorization in October, 1933. Children have found physical comfort and relief from the strain occasioned by overcrowded living conditions and worried adults. They have, day by day, learned those health habits fundamental to wholesome living. They have had the opportunity to play with others of their own age, and to learn the social habits that come from such play. Parents have learned how to provide better physical care for their children and how to guide their behavior better. Many communities which heretofore knew little about nursery schools have seen the above mentioned services and are already laying plans for making nursery schools a permanent institution in the community, since they have demonstrated in some measure their function as a social agency.

In laying such plans care needs to be taken that only the best of the emergency program is preserved, and that in building for the future there is ever kept in mind the standard of what a good nursery school really is and that only the best is planned for any community. This points to the need of informing one's self concerning the standards for a good nursery school and passing on that information to the general public.—*Parent-Teacher News Release*. Jan. 25, 1935.

EDITORIAL SECTION

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VITAMIN D MILK

THERE is always something new coming up concerning milk. For a number of years it was chiefly the discussion of bovine tuberculosis and its transmissibility to human beings. The English and our Canadian friends are still struggling with this question which has come to the fore on account of investigations made within the last few years in those countries. In America the matter was threshed out some 30 years ago. To our Bureau of Animal Industry we owe our present excellent position in regard to this question. Pasteurization is now so general in our cities, at least, that cases of bovine tuberculosis in human beings are not common.

Next came the vitamins, and later the evidence that some, instead of being a single substance, carried several of these remarkable products. For the past 2 or 3 years the discussion has centered largely around the so-called vitamin D milks, and they are being urged on the public from a number of different directions, many of them entirely commercial.

Let it be said at once that there is no question about the fundamental facts involved, or the real value of vitamin D milk, properly prepared. The methods of making vitamin D milks and a discussion of them were published in this *Journal* in the issue of December, 1932, and since, editorials on the subject have appeared. There are three methods now in use for preparing vitamin D milk for the market: one by feeding cows irradiated yeast; one by irradiating the milk directly; and one by adding to milk a concentrate, usually made from cod liver oil (Zucker method). There is a fourth method—irradiating the cows—which need not be discussed here.

Each state and practically each city has laws regarding milk, with definitions of adulteration, pasteurization, modification, etc. A legal opinion has been rendered in one city allowing the sale of irradiated milk, but not vitamin D milk made

by the Zucker method, since it is forbidden to add substances to milk, but there is no prohibition against the use of radiant energy or the possible effects it may produce!

A recent report [1] discusses this question in what seems to us an eminently sane way, pointing out that the only milk which can be called "vitamin D milk" correctly is that produced by feeding cows irradiated yeast. Milk which is irradiated after being drawn should be called "irradiated milk." If the exposure is incorrect, there are substances in the milk which may be injuriously affected, and off-flavors developed, due probably to oxidization of fats or changes in the protein. It has been shown that there is some effect other than the change of provitamin substance into vitamin D, since skim milk can be activated. Indeed, skim milk, whey, and casein all contain sterol, but the lactalbumin has been found to contain a concentration which is more than half that of the butter fat, and that sterol so combined is more constant than that of the other milk constituents. The conclusion is that the sterol of the whole milk seems to be independent of the fat content.[2] Inquiries from a number of those supplying equipment and processes indicate there is no standard method applicable to the various types of equipment and apparatus. Recording ammeters in common use give amperage, but not ultra-violet radiation, though meters which record ultra-violet rays have been developed and others are being developed, but their practicability remains to be proved.

It will be remembered that Steenbock took out a patent on his irradiation method and turned it over to the Wisconsin Alumni Research Foundation, which has licensed a number of producers of evaporated milk. So far, clinical and experimental research on irradiated evaporated milk seems to be deficient. The foundation says that clinical studies have been conducted, but the results had not been published (July, 1934). The advertisements of various concerns manufacturing evaporated milk under license differ considerably. One states that the product is not offered as a cure for rickets, but as a reliable preventive of rickets for normal children. It seems impossible to reach any other conclusion than that the subject is still under study, and that much remains to be learned.

As far as the production of so-called vitamin D milk according to the Zucker process is concerned, the committee holds that the name is not correct, and that it comes distinctly under the head of "modified milks." The manufacturing of this product has been turned over to a company which is now putting the concentrate into cream, the object being to avoid the addition of an extraneous fat to the milk. Even this, however, will not overcome the legal objection to selling such milks under many of our existing laws.

Among the various bodies appointed to study this question generally is the Committee of the New York Academy of Medicine. After quoting an experiment to show that rats may be fed excessive quantities of vitamin D without injury, they say, "The advisability, therefore, of universal or general energizing of milk does not seem apparent." It is this point which we wish to stress, whatever form of fortifying is adopted. Reed [3] has fed viosterol to 300 human subjects from 7 to 72 years of age, the doses ranging from 3,000 to 2,760,000 international units daily. Of these, 43 patients showed definite symptoms of toxic poisoning in varying degrees. He says that there need be little apprehension of poisoning through giving amounts ranging up to 150,000 international units daily for indefinite periods.

It requires pretty constant reading to keep up with the work which is being

done on the vitamins in general, and particularly vitamin D, during the last few years. As far as we can judge, those most competent to speak believe that there is much to be learned. If this is not true, many people are wasting money in useless experiments and study. However, the commercial interests have, as usual, taken hold of this idea and are pushing it. Even the Wisconsin Alumni Research Foundation is pushing it by methods which do not appeal to us. Their literature is apparently written by an advertising agent and abounds in short quotations which do not tell the whole story, though most are from those entitled to speak with authority. For example, one writer is quoted as saying, "The literature of the decay of teeth, osteomalacia, etc., gives definite evidence that vitamin D is necessary throughout the whole of life." This does not mean that any form of so-called vitamin D milk is necessary, though that is the implication, since there are many other sources of vitamin D available. The leaflet containing this statement is addressed to the medical and dental professions, but has been sent to a number of laymen.

In one pamphlet sent out late in 1934, statements are made which would indicate that this Foundation is working with the American Medical Association. It is true that the Committee on Foods of the A.M.A. has accepted a number of vitamin products, but they have also recognized the absence of clinical study and have set up tentative standards.

We do not wish in any way to be understood as objecting to the use of vitamin D milk. It does seem, however, perfectly clear that claims are being made for which there is no good evidence, despite which many so-called vitamin D products are being exploited by the milk industry and by patent and process licensers, and are being urged through the use of professional organization endorsement. We agree with the conclusion of the report from the A.P.H.A.—"Not until proper judgment and control of this entire matter is exercised by those having commercial, professional, and patent interests can it be expected that general confidence can be secured and the public given proper products scientifically proved to be of real merit or worth. Only by such method can exploitation of questionable products be prevented and legitimate products be accepted."

REFERENCES

1. Palmer, William B., *Chairman*. Report of the Committee on Milk and Dairy Products. *A.P.H.A. Year Book, 1934–1935* (Supplement to *A.J.P.H.*, Feb., 1935), pp. 62–68.
2. Sterols in Milk. Editorial, *J.A.M.A.*, July 21, 1934, pp. 190–191.
3. Reed, C. I. *J.A.M.A.*, May 26, 1934.

DR. THEOBALD SMITH—SCIENTIFIC PHILANTHROPIST 1859-1934

ON December 11, 1934, Dr. Theobald Smith, world-famous pathologist, died of heart disease at the ripe age of 75. His passing does not end his service to mankind, however, for the influence of his work will be immortal. He was a scientific philanthropist in the sense that his gifts in the form of new medical knowledge have added to the life span and health of multitudes, in addition to bringing vast economic savings to industry and agriculture.

Born in Albany, N. Y., in 1859, he received his first scientific degree, Ph.B., at Cornell, in 1881; and the degree of M.D. at Albany Medical College 2 years

later. Some 11 universities conferred honorary degrees on him, and he was awarded 7 medals. He was a member of many learned societies in this country and abroad.

Dr. Smith's productive researches began early in life. Several of his most important discoveries were made during the period 1884 to 1895, while he was a young scientist on the staff of the Federal Bureau of Animal Industry. Two years after the beginning of his Government service, in association with Dr. D. E. Salmon, he made important contributions to the knowledge of bacterial immunity. These two scientists found, in 1886, that killed cultures of bacteria would protect animals against subsequent infection with the live organisms. Other investigators developed this knowledge into practical methods of immunization against many diseases. Later Dr. Smith and his associates, Dr. F. L. Kilborne and Dr. Cooper Curtice, studied the biology of the cattle tick. This brilliant trio of investigators proved that tick fever was transmitted solely through a living carrier of the infection, and not, as had been suspected, through mere contact with other animals nor from feed, water, or air. This discovery led to practical measures of controlling and eradicating not only tick fever, but many dreaded human diseases spread by insects and other parasites.

Turning his attention to tuberculosis, Dr. Smith demonstrated for the first time that the germs of the human form of this disease differed from those of the bovine form. At the laboratory of the State Live Stock Sanitary Board of Pennsylvania, it was shown that the bovine type of organism was transmissible to man—especially children.

Dr. Smith was a pioneer in the study of allergy (Theobald Smith's phenomenon), that curious sensitiveness of persons and animals to certain substances. His studies opened up a vast field of research relating to foods, drugs, and biological products.

All these discoveries subsequently led to improved scientific and practical means of safeguarding the health of man and domestic animals. In the later years of his life, Dr. Smith directed the Department of Animal and Plant Pathology of Rockefeller Institute for Medical Research. The results of his researches there also enriched various fields of scientific knowledge. Honored by many professional organizations and institutions, Dr. Smith belongs primarily to the people for whose welfare he so diligently, successfully and unselfishly labored.

LETTER FROM GREAT BRITAIN

ON SHINING EXAMPLES

One of the more common methods adopted by health officers and others engaged in the public service of this country of securing advance or the adoption of some particular scheme or measure is by crying out that it is in operation in some other country. In the pre-war days it was usually Germany that was chosen. Since the war almost invariably the shining example has been the United States, and one says, after the manner of Sterne, "this, that, or the other thing they order so very much better in America."

In relation to milk, for example, the cry that our practice lagged very far behind the American was so very loud and persistent that tremendous activity developed, and now it is claimed for the milk supply here that it is every bit as good as that of the United States. One respect in which it is admitted with just sadness the British are still behind is in the matter of *per capita* consumption. The amount consumed by each member of the community works out at something ridiculously below half a pint. Even that, however, looks like being put right, and the legislature and everybody else will be much surprised and hurt if within the next year or two the people fail to show themselves a nation of milk drinkers, consuming considerably more than whatever is the maximum amount taken per head in any of the States in the Union. This is to be brought about as a result of a law which received the consent of the King at the end of last session.

MAKING A NATION OF MILK DRINKERS

This is known as the Milk Act, 1934, and among other things it provides for the grant from the national funds of large sums for expenditure on schemes for improving methods of milk production and of increasing consumption. Incidentally it contains provisions under which school children may obtain milk daily in school for a purely nominal sum, the difference in cost being paid to the retailer through the Milk Marketing Board. This body, which was only recently established for the purpose of securing more equitable conditions for milk producers, particularly, and more even distribution of the article, has also as an aim popularizing and encouraging its wide use. The scheme of providing a cheap supply to school children the Board has taken up most enthusiastically, seeing in it a method of disposing of large quantities of surplus milk that might otherwise prove embarrassing. They welcome the scheme also—as must all who hold milk in high esteem on account of its nutritive qualities—because they believe that it will circulate the milk drinking habit and will insure an increase in the consumption of milk by adults and a raising of the per head figure to something of which no proud patriot need be ashamed and that will compare favorably with, or even overtop, that of America.

In the scheme prepared by the Milk Marketing Board it is provided that subsidy payments shall only be paid if the medical officer of health of the district in which the milk is distributed is satisfied as to the source and quality of the milk supplied and certifies accordingly. In certain areas, including the metropolis, pasteurized milk will be specified and for his half-penny—about one cent—the child will receive one-third of a pint in a capped bottle and a straw through which to absorb it. Already over a fairly large part of the country a voluntary scheme of supply has been worked for some years, so

that there should be no difficulty in putting the nation-wide scheme into operation in the schools this year.

HEALTH IN INDUSTRY IN 1933

The chapter on health in the report of the Chief Inspector of Factories and Workshops for 1933 is as usual contributed by Dr. John C. Bridge, the Senior Medical Inspector. Dr. Bridge, by the way, was recently created C.B.E. or, as the toast-masters describe it, "Commander of the most noble Order of the British Empire," in recognition of the value of the work he has done on behalf of the health of the workers. As always, from the point of view of health officers and others concerned in the preventive side of medicine, the health chapter is the most interesting of the several extremely interesting contributions to the report. On this occasion, so far as general health is concerned, Dr. Bridge finds himself able to report favorably.

Accidents, it is true, were numerous, but this was due to the fact that the numbers in employment were higher and many of those engaged having been off work for so long were, for a time, unaccustomed to the working conditions, machinery, and so on. In other directions the impression gained was that nothing but benefit came to the industrially employed from employment. In order to be quite sure, however, regular medical examinations are felt to be necessary. To these both employees and employers appear to be averse.

A note in the report on the effect on women of industrial work has received a great amount of attention, more especially since the conclusion reached is that, though there is an adverse side to industrial life for women, the general effect is "good—judging from some years of observation in factories—and getting better." Among items on the credit or beneficial side are "the stimulating effects of the discipline and interests attendant on factory life during and after hours, with the higher standard of living that is the wage-earner's. Conditions in factories are, in general, as good and, in many cases, better than those of the workers' environment. The food available at factory canteens and clubs is good, varied and cheap. Factory life certainly raises the standard of personal hygiene among girls." On the adverse side the main effects upon the girls appear to be that "they age quickly; their apparent age is the elder sister to their baptismal certificates. Physical attraction is early attained and quickly lost." The reason given for this is that "women's work often begins when it normally ends. The house and dependents make their claims on the woman worker. Her work is never done."

INDUSTRIAL DISEASES

In the matter of industrial diseases it is noted that cases of poisoning with lead, arsenic, and other metals were fewer than in 1932, as were also aniline and carbon bisulphide poisoning. Anthrax cases, on the other hand, showed an increase, particularly among persons engaged in handling skins and hides, articles notoriously difficult to disinfect.

Special reference is made to the fact that the incidence of epitheliomatous ulceration "now the most menacing of all the industrial diseases that are notifiable," shows few signs of diminishing. Persons working with pitch and tar (in patent fuel works, etc.); with paraffin (in shale oil works) and mineral oil (in cotton mule spinning, etc.) are those chiefly liable. In addition, cancer of various parts occurring among persons working with certain dyes and chemicals and in such places as nickel refining works are giving rise to anxiety. Silicosis and asbestosis, as well as certain new forms of poisoning occasioned by the use of chemicals, many of them

complex in character, of the effects of which on the human subject little as yet is known, come in for special reference also. In the case of asbestosis it would seem that since the introduction of special regulations applicable to the asbestos industry, the problem has been solved. Silicosis and tuberculosis among persons engaged in sandblasting seems likely also to be conquered in the near future since the discovery that results quite satisfactory may be obtained by substitution of steel grit for siliceous material as an abrasive. The impression obtained from the report is that eventually, in this country at any rate, the use of the latter will be prohibited, except under special circumstances.

DIOXAN POISONING

Among the new forms of poisonings occasioned by the use of complex chemicals, attention is specially directed to that due to the inhalation of Diethylene Dioxide ("Dioxan"). This substance, used in the manufacture of artificial silk for treating cellulose acetate silk yarn, in one instance led to the death of 5 men in one plant, the signs being severe gastric disturbance followed by acute hemorrhagic nephritis leading to suppression of urine, uremia, coma, and death. A most serious view was taken by the department of these cases and eventually the plant in which they occurred was closed and an undertaking given that no further work would be done necessitating the use of Dioxan until all means had been taken to insure safety of the working conditions. Experiments to determine the extent of the toxicity of the material and the precautions necessary to be taken are now in hand. Further, it has been arranged that before any of the new organic compounds now so widely used as solvents, etc., are put upon the market they shall be tested physiologically for toxicity. Dermatitis among persons engaged in certain industries continues to attract attention and reference is made in the report to the measures of prevention likely to prove effective. One most valuable suggestion offered by Bridge is that there should be regular inspection of workers' hands by a careful observer. In this way, he holds, the necessary precautions are likely to be taken, early signs of skin irritations can be detected and relieved before the resistance of the skin breaks down.

LEGGE'S "INDUSTRIAL MALADIES"

While I am on the subject of industrial hygiene and diseases of factory workers, I should like to refer to a book published here by the Oxford University Press. Written by the late Sir Thomas Legge, one time Senior Medical Inspector of Factories, the work has been edited by Dr. Henry, a Medical Inspector of wide experience in the Factory Department. Sir Thomas Legge was one of the makers of industrial hygiene and, in his day, a recognized authority on industrial diseases. Evidence of the high esteem in which he was held in the United States is to be found in the fact that his work was as well known there as here and on several occasions he was called upon to deliver courses of lectures in American medical schools. The work contains chapters upon most of the industrial diseases and poisonings, as well as upon such matters as notification of industrial disease, compensation, and health and welfare conditions in factories and workshops. Authoritative and informative, Legge's work is to be counted an outstanding contribution to the literature relating to the hygiene of, and diseases associated with, industry.

CHARLES PORTER, M.D.

London

PUBLIC HEALTH EDUCATION*

Comic Strips 40 Years Old—1894 saw the birth of the comic strip. Have we noted the considerable proportion of non-comic strips as the years have passed? Adventure, science, and history have their share of the strips. Why not health? Why should not some of our clever health people devise an idea for real health information to appear in acceptable strip form?

Said *Editor and Publisher* recently:

> Entertainment can be combined with more than a little education on the strip page and some artists are doing it well without any attempt to be funny.

"1,820 Ways to Avoid Monotony"—This is the heading of a page advertisement of an advertising agency, Young & Rubicam, New York. Here is part of the text, the application to health education being left to the reader:

> A certain New York business man lives at 58th Street and First Avenue, and has his office at 46th Street and Park.
>
> One day while lunching with a mathematics instructor at Columbia, he chanced to comment on the monotony of his daily walks from home to office.
>
> A few days later, he received a note from the instructor, containing mathematical proof that there were 1,820 routes between his home and his office, all of them different and all the same distance.

Is It Public Versus Private?—In some communities finances have aroused something of a "public versus private" competition for the approval of the public. Probably this arises in the relief field and is less likely in public health. At any rate those concerned with public welfare will wish to look over the Dec., 1934, issue of *News Bulletin*, Social Work Publicity Council, 130 East 22d St., New York, N. Y. There is a section on what private agencies say about governmental service during money raising campaigns. *25 cents.*

Why Not Immunize?—The Santa Barbara County Health Department reports on 355 children between 6 and 15 years old, none of whom had been immunized against diphtheria. The reported excuses from the 164 homes were classified as follows:

Lethargy: 51 (31 per cent), including such answers as: "I will next time"; "Too much trouble"; "All right—if the child wants it"; "Forgot to come."

Ignorance: 26 (16 per cent), including such answers as: "Too young yet"; "Already had diphtheria"; "Wait till exposed" "Just another fad"; "Not afraid of diphtheria"; "We didn't have it when we were children"; "Never been sick."

Opposition: 84 (51 per cent), including such answers as: "Don't believe in it"; "Made neighbor's child's arm sore"; "Religious objection"; "Poisons the blood"; "Previous unpleasant experience"; "It would hurt"; "Don't like the idea."

Economic Reasons: 1, "Have lately moved here; was not given free where I lived."

Legitimate Medical: 3, "Child has been sick"; "Our doctor (chiropractor) advises against it."

Dr. R. C. Main, county health officer, comments:

> It appears, therefore, that our failure to wipe out diphtheria completely is due, in large part, to opposition of the parents. We have learned, however, that this attitude of the parents is not unchangeable. Again and again, by the use of tact and a continuous educational program upon the subject, we have had parents apply for this protection for their children when they had previously bitterly opposed it. Indeed, many of the

* Please address questions, samples of printed matter, criticism of anything which appears herein, etc., to Evart G. Routzahn, 130 East 22d St., New York, N. Y.

children listed in this study have since been immunized.

In *Weekly Bulletin,* California Dept. of Public Health, Sacramento. Nov. 24, 1934.

The Demand for Reader's Time—A writer addressing printers tells why printers must produce better printing so that more printed matter will be used. Health agencies buy printed matter to get a hearing for facts and ideas and so they face these same conditions.

Printing in general is not as effective in producing results as it used to be. Why? The answer is to be found in changing conditions, which have brought about a more severe competition for the full attention of readers to whom each piece of printing is to be addressed.

If you want to discover the fundamental reason why printing of a given quality is not doing the job it did 10 years ago, just analyze how you spent your own time for the past 10 days. Schedule, day by day, how much time you devoted to reading *any* kind of printed matter. Deduct from that the time spent on the first page of the newspaper or on a new novel, and you will begin to get some measure of how much of your time is available to those who seek to address sales influencing messages to you through the medium of printed advertising.

Try this same analysis on friends and you will find a like situation. Fume though we may, the radio, the movies, the new streamlined autos, and many other attractions are appropriating more and more of the time formerly available for the reading of printed matter. The cozy evening spent under the lamp, with a variety of magazines, booklets, or pamphlets, is becoming the exception rather than the rule.

The author, Douglas C. McMurtrie, puts this question:

Is printing today as much better and more attractive than the printing we did 10 years ago as the popular-priced automobiles of the present season are improved in style and performance over those on the market 10 years ago?

Let health workers, as well as printers, face the facts:

Printing today, which seizes the few precious available moments of attention, must be made outstanding in design to attract and to invite the eye. Your piece must be one among a dozen to demand and secure that attention, constantly harder to hold.

When we once get that attention, we must also make better use of it. This means attractive, lively pages, with type intelligently set, so as to interpret the copy story to the reader in crystal-clear fashion. Illustration must be vivid and graphic.

Among the practical suggestions offered, the following may apply to some health material:

There are possibilities in the reduction of size. Any booklet, set sloppily in an indifferent type face and printed on cheap and unimpressive paper, can often be cut a half inch in each dimension, set up with taste and care, and printed on a better quality and more suitable paper, at the same cost and with greater satisfaction to the customer.

When submitting a printing job as we have planned its specifications we may well ask the printer how he would plan it if he "started without limitations."—*Inland Printer,* 205 W. Wacker Drive, Chicago. June, 1934. *40 cents.*

"Fight Tuberculosis with Modern Methods"—This, the slogan of the 1935 Early Diagnosis Campaign (EDC), seems the logical follow-up to the preceding campaign themes.

It takes time for new ideas to take root and patience to dispel deeply-rooted fallacies. Yet, we can greatly hasten the acceptance of sound, balanced knowledge through intelligent publicity. Fortunately, public interest in the newer technics of treatment plays into our favor. For these reasons, tuberculosis associations throughout the country have agreed during 1935 to concentrate their educational resources on treatment.

Some may feel that it is quite enough to urge people to go to the doctor and say nothing about treatment. They ask: "Why should the public be informed on treatment?" The first obvious answer is that misconceptions never do any good and it is our job to present the true and modern facts. Another is that an appreciation of scientific medicine is one of the major objectives of health education and the modern treatment of tuberculosis inspires a respect for scientific medicine. A third reason for selecting this theme is that a general knowledge of the treatment

of tuberculosis dispels, to a large extent, the fear of tuberculosis, and prompts the person who may be worrying about his health to go to a scientific doctor rather than to a cultist or to the drug-store. Add to these reasons the demand for a specific explanation of pneumothorax on the part of a limited but increasing number of patients (doctors find it difficult to describe to the non-medical person) and finally the advantage of building up strong public sentiment in favor of the sanatorium.

The weapons of the campaign are of a high order. Four 4-page folders are on dull finish paper, the cover a photograph bleeding four ways with title lines across top and bottom, and with uncrowded text inside. "Modern Weapons to Fight Tuberculosis" contains three times as much text. There are other publications, slides, posters, and motion pictures available. All local tuberculosis associations are supposed to have samples.

It is for the state and local health agencies to make the most of the excellent material provided and the impetus given by the National Tuberculosis Association.

The "Comforter" in Jamaica—Says Mrs. Smith, in *Jamaica Public Health*, Kingston:

What will the Government be doing next to one's children? First, it's registering 'em as soon as they's born, just like they was so many thoroughbred cattle; then it's sending around a sanitary inspector to have you build a latrine which they say will keep off the bowel troubles and the bad fever; then it's taking 'em to have their hands scratched and be vaccinated so they won't catch de alastrim. Then they tells you to bwoil the milk and water for the little 'uns and not give 'em cerassee tea, and to clean their milk teeth and keep 'em fixed just the same as if they was their second teeth. And when they go to school they have to get their teeth fixed, and they sends 'em home when they get measles or the whooping cough or even the itch; then a man comes to give 'em Government pills to cure 'em of hookworms. And now they're blaming the comforter and say it causes de tb. What will come next? I don't take much stock in such unpractical ideas. I'll bet if de truth known I have raised more picknies than that Bureau or the Government both put together. Five out of my 8 are living and doing well, except for coughs and colds, earache and toothache, and such natural ailments and ever' single one of them was raised with comforters to keep 'em quiet. Next I looks for de Legislative Council to pass a law indicting honest folks for having typhoid and other God sickness dem. Aunt Eliza Bush-Tea recommend de comforter; she say it keep de gums healthy and she say bush tea and sugar pap is good for babies, too. That Bureau ought to be doing something practical to benefit folks and leave off hadvocating so many high-falutin' ideas them don't have no experience with. That my say!

For the Sunday Newspapers—In July, 1934, Iowa State Department of Health started a special series of releases to the Sunday newspapers of the state.

"Public Health in Fiction" reviews "Silver Linings" a novel by Joseph McCord who made good fictional use of a public health situation, but whose factual material on typhoid was nearly all wrong.

"Can This Be True?" was a series of paragraphs about smallpox, early bath tubs, and other near or far facts or superstitions.

A December 30 release on "The 1934 Health Record" was based on the death records of the first 9 months.

Most of the series is prepared by Dr. J. H. Kinnaman, Division of Child Health and Health Education.

Hygeia for January, 1935—We find a new type of table of contents, each item with a concise descriptive paragraph. We may want to try it on a booklet or an annual report. Then there are articles on

Preventing heart attacks. Sex education for young children. Why condition the air? (Many reasons for it.) These teeth of mine (a new series). The new generation (by a champion). The making and unmaking of a quack (mail order diagnosis). "Occupational diseases" in children (not what it sounds like). Government's interest in violent and sudden death. Overcoming worry (measures

of habit control). Occupational diseases of musicians. Some obesity "cures" and "treatments" (fantastic claims). A.M.A. cheese decisions. Intestinal worms. Diseases of the eye. Tuna fish. Picture section (as usual). New books on health. Questions and answers. School and health: The dominant influence of the teacher. Health teaching in January. Hygiene and the use of the dictionary. Health lessons in a rural school. How shall we teach safety? New health books for teachers.

Help in Preparing a Teachers' Health Year Book—From the National Education Assn., 1201 16th St., Washington, D.C., comes this request:

The Department of Classroom Teachers of the National Education Association has in preparation a yearbook dealing with the health of the classroom teacher—physical and mental.

Please direct our attention to any published material that you regard as especially helpful in the field of teacher health. We would appreciate greatly the receipt of any pertinent materials not generally available in libraries, such as leaflets or mimeographed reports. If important research projects relating to teacher health are under way, please describe briefly what your organization is doing or let us know where to obtain the information.

We should be glad to have you refer to outstanding contributions from other sources.

Reply to Ivan A. Booker, Research Division.

Optimism Needs Correction—One of our special correspondents, reporting on observations at Pasadena, mistakenly mentions the recent passage of a mattress regulation in Baltimore.

Dr. Huntington Williams reports that

As far as I can find out, there has been no new regulations in this matter in Maryland since 1931, nor has there ever at any time been any regulation or law for the city of Baltimore as such.

This refers to "What We Noticed at Pasadena" in Dec., 1934, issue.

Das **Wunder Des Lebens**—Dr. Bruno Gebhard of the German Museum of Hygiene, has sent us the announcement of an exhibition called "Das Wunder Des Lebens," which is to take place in Berlin from March 23 to May 5, 1935. The substantial booklet describing the exhibition is illustrated with strikingly colored and most original photographs and drawings.

Through pictures and text the human body is brought into relation to elements in nature, to outdoor life, to industry—to the whole of life. Keeping well becomes an exciting adventure.

Health Education in Massachusetts—A "Health Education" issue of *The Commonhealth*, Massachusetts Dept. of Public Health, July–Sept., 1934, provides a review of much of the thinking as to health education and its actual practice in Massachusetts. Several times we have given up the attempt to review these 72 solid pages of varied material. So much of it has a bearing in all parts of the country that copies sent to state and local health agencies should be carefully preserved and made available to all health workers in the state or community.

Here are some topics:

Prerequisites of a progressive health educator; health department bulletin; a local health association; what a large city health department does; in the Y.W.C.A.; a hospital dispensary; in mental hygiene; prenatal and postnatal letters and other printed matter; school lunch; demonstration or example by display; home-made posters and charts; exhibits; in the schools; supervisor of health education; classroom teacher; physical education; preparation or material for school use; junior high school course; the health forum (radio); visual methods.

Health Education in a Small City—This topic was presented at a joint meeting of Canadian Public Health Association with two other groups by Dr. D. V. Currey, Medical Health Officer of St. Catharines, Ontario.

Dr. Currey said:

. . . the further one enters this field of endeavor the more he realizes his opportunities and finds that no one method is entirely satisfactory, but that the combination of plans will give the best results. There is no doubt

that all public health teaching must be positive, nontechnical, and, above all, interesting.

He then discussed the practical use of public addresses, newspaper publicity, bulletins, pamphlets, motion pictures, exhibits, hospital day, direct to the home, parades, and broadcasting.

Health education of the public should be the most important duty of any health officer and should be part of every health program.

Each member of the department of health staff should continually be on the lookout for new ideas, new types of posters, etc., which may be used for the purpose of educating the public.

—*Canadian Public Health Journal*, 105 Bond St., Toronto 2, Ontario. Nov., 1934. *35 cents.*

To Meet School Health Leaders in Europe—The Health Section of the World Federation of Education Associations is arranging a European travel and study tour in connection with the Federation meeting at Oxford, England, August 10–17, 1935. Leaving New York, June 29, the tour will visit France, Switzerland, Germany, Poland, Russia, Finland, Sweden, Denmark, and England. The group will meet the leaders in school health in each of these countries. For further information, write to the chairman of the Health Section, Professor C. E. Turner, Massachusetts Institute of Technology, Cambridge, Mass.

RADIO

The Massachusetts Dept. of Public Health radio program for Oct.–Dec., 1934, was in three sections:

"Health Messages," 4:30 p.m., Wednesdays, Station WBZ, papers prepared by members of Massachusetts Medical Society; "Health and digestion . . . Old age deferred . . . Appendicitis . . Hospitals . . . Gall bladder trouble . . . Prenatal care . . . Anemia and its treatment . . . First aid . . . Protecting the school child from fatigue and strain . . . Abdominal pains . . . How surgery and advances . . . Angina Pectoris . . . Arthritis."

"Health Review," 1:30 p.m., Tuesdays, Station WEEI, historical sketches by Eleanor J. Macdonald: Edwin Chadwick . . . The contribution of Edwin Chadwick to Public Health . . . Lemuel Shattuck . . . The report of 1850 . . . The report of 1850 continued . . . The 1869 Board of Health and vital statistics . . . The State Board of Health, lunacy and charity and the re-establishment of the State Board of Health . . . The State Board of Health . . . Massachusetts Dept. of Public Health . . . Water . . . Methods of obtaining water through the ages . . . Modern methods of obtaining a pure water supply . . . Pure water and filtration.

"Health Forum," 5:00 p.m., Fridays, Station WEEI, short topics requested by radio audience on health matters by Lila O. Burbank, M.D.

Recent broadcasts by Minnesota State Medical Assn. (Station WCCO, Tuesdays, 10:45 A.M.):

Diabetes in Minnesota . . . Blood transfusions . . . Progress in public health . . . Warts and moles . . . Encephalitis.

Station WIXAL is the short wave, non-commercial station, "dedicated to enlightenment." You will find it between DJC, Berlin, and GSA, Daventry. 6040 kc. For program address World Wide Broadcasting Corp., University Club, Boston, Mass. No health topics as yet, but we will expect them in due season.

Station W.H.Y. is the way station names are spelled, with periods, by some health and welfare workers. But in actual practice the form is Station WHY, that is, without periods.

SCHOOL HEALTH EDUCATION

A $500 scholarship in health education, at Massachusetts Institute of Technology, 1935–1936, is available for women only. Write to National Tuberculosis Assn., 50 W. 50th St., New York, N. Y.

"A Project in Rural School Health Education," by R. E. Grout. Reprint from *Milbank Memorial Fund Quarterly*, 40 Wall St., New York, N. Y.

10 cents. Building the program in Cattaraugus County.

"State-wide Trends in School Hygiene and Physical Education," by J. F. Rogers, M.D., Office of Education. Revised. Supt. of Documents, Washington, D.C. *5 cents.*

MATERIAL WANTED

E. Kohler, George Williams College, 5315 Drexel Ave., Chicago, Ill., writes:

Our class in health education at George Williams College is composed largely of teachers and leaders in social work. We are interested in any material available on health education and would appreciate having copies of any free health material you may have or lists of publications if free material is not available for all.

BULLETINS AND JOURNALS

"Know Your Health Department" is a series of brief sketches, with photographs of staff members. *In Birmingham's Health,* Birmingham, Ala.

Michigan Out-of-Doors is now *Health,* issued by Michigan Tuberculosis Assn., Lansing.

"Millions of Names" tells about the state registration of vital statistics. In *Weekly Bulletin,* State Dept. of Health, Sacramento, Calif.

Prize winning stories from the recent contest conducted by *Journal of Outdoor Life,* 50 W. 50th St., New York, N. Y., are being published in that magazine, starting with Dec., 1934, issue. *15 cents an issue.*

Wolverine Health Bulletin, Michigan Tuberculosis Assn., Lansing, Mich., is issued for school room use. Monthly, two parts of 4 pages each.

A full-page picture of a child "bleeds" over all four sides of the page, on cover of the November, 1934, issue of *Everybody's Health,* 11 W. Summit Ave., St. Paul, Minn. *10 cents.*

On the cover page of this issue of *Health* (in center of a big white space) appears the number 2,309,513,600, a sum almost too large for the mind to appreciate. This figure represents the number of heart beats that the average New Havener may anticipate during his lifetime under present conditions of living and based upon the life expectancy which is, at birth, a little more than 60½ years.

The above from *Health,* New Haven Dept. of Health, was followed by a brief application. A striking detail for a health bulletin, but we think that it would have been more effective if the explanatory paragraphs had been made more conspicuous. They were buried at end of an article not related to the cover page figures.

FOR EDUCATION OR REFERENCE

"The Costs of Tuberculosis with Special Reference to the Adequacy of Medical Care and Treatment," by R. A. Seder. National Tuberculosis Assn., 50 W. 50th St., New York, N. Y. 35 pages. *20 cents.* A study suggested by Committee on the Costs of Medical Care.

If there is a slum clearance movement in your city the leaders will be glad to receive from you a copy of "An Analysis of a Slum Area in Cleveland," prepared "with the counsel of Howard W. Green," of the Public Health Education Section, 1900 Euclid Ave., Cleveland, Ohio. *60 cents.* Shows how much it "costs government and society to maintain a slum."

Julius Rosenwald Fund, 4901 Ellis Ave., Chicago, Ill., has 8 posters, 20" by 30", enlargements of the picture book charts on costs of medical care. Posters are sold for $4.50, or will be loaned. A copy of the picture book is free.

"Mortality Experience of First Nine Months of 1934," and "Geographic Distribution of Mortality" in *Statistical Bulletin,* Metropolitan Life Ins. Co., New York, N. Y. Oct., 1934. *Free.*

"Protected from Harm" is a 4-page folder on diphtheria from the Milwaukee, Wis., Health Department. It is an effective straight-forward presentation emphasizing that "most of the

school children" and "many of the children below school age" have been protected. Please enclose *3 cents* postage with a request for sample.

"A 'Recovery Act' for the Handicapped," by Edward Hochhauser, 71 W. 47th St., New York, N. Y. Values of the "sheltered work shops," Enclose *3 cents* postage.

"Twenty-Five Years History of the Ohio State Sanatorium" is reprint of articles by R. G. Paterson, 72 S. 4th St., Columbus, Ohio. Enclose *25 cents* postage.

Two chapters in "The Man with Bated Breath" are devoted to the physical and mental effects of smoking marijuana.

"What You Should Know about Tuberculosis" is a 30-page "handbook for tuberculosis patients." With substantial cover, good type, wide leading, and distinctive headings the pamphlet looks easy to read. Every right hand page carries a line cut which bleeds to the center and the top of the page. Obtainable through the national and other tuberculosis associations. You will want to know about tuberculosis when you see this pamphlet.

Good material for bulletins and other uses is offered in the Nov., 1934, issue of *Statistical Bulletin*, Metropolitan Life Insurance Co., New York:

> The chances of celebrating a golden wedding (as well as tin and silver weddings); 3,000 persons killed annually in shooting accidents; insect-borne diseases can be eliminated.

If you have need for information about the Women's National Health Council write to National Health Council, 50 W. 50th St., New York, N. Y. The "Council" is promoted by L. Ellis Evons, advertised as a "professor, noted biologist and sexologist."

"Leprosy: Observations on Its Epidemiology in Hawaii," by U. S. Public Health Service. Dept. of Documents, Washington, D.C. *5 cents.*

"Meat Dishes at Low Cost." U. S. Dept. of Agriculture, Washington, D.C. Another contribution from the Bureau of Home Economics, Supt. of Documents, Washington, D. C.

A monthly clip sheet free, based on magazine articles, is supplied by *Hygeia*, 535 N. Dearborn St., Chicago, Ill.

"Out of Babyhood into Childhood." Children's Bureau, Washington, D.C. 8 page folder. Habits and care of the 1 to 6 year old. *Free.*

"Publications on Low Cost Diet." Revised edition of list of publications for reference and for distribution—for administrators, workers, clients. Social Work Publicity Council, 130 East 22d St., New York, N. Y. *10 cents.*

"Reduction in Health Department Activities" is the "round table" subject in June and July, 1934, issues of *Municipal Sanitation*, 24 W. 40th St., New York, N. Y. Single copies, *25 cents.* Many health officers answer 4 questions, and show how essential work is carried on despite decreases.

Reprints from *Journal of Social Hygiene*, 50 W. 50th St., New York, N. Y., at *10 cents* for single copies:

"High Points of the Conference on Education for Marriage and Family Social Relations." 12 pages.

"Betrothal," by P. Popenoe. 8 pages.

"What Every Person Should Know About Milk," by L. S. Frank. Discusses: Why is milk such an excellent food, and how much of it should be included in the diet? How can milk be safeguarded to prevent it from transmitting disease? How can consumers be certain that milk they drink has been thus safeguarded? *Public Health Reports*, U. S. Public Health Service, Washington, D.C. Dec. 14, 1934.

NEWSPAPERS

"Smite the Mite" is an Iowa State Dept. of Health news release on scabies.

Vital statistics for 1933 were highlighted in a news release from the New

York State Dept. of Health, with this "lead":

Babies born in New York State today have a far better chance of surviving the first year of life than did those born 25 years ago.

"Efficient Health Service Safeguards People's Welfare" is a page-wide headline at the top of a special section of a holiday edition (Dec. 15, 1934) of *Hamilton Spectator*, Hamilton, Ont. Of special interest is "Mr. Average Citizen Hears about Hospital" in which "John Brown, one of Hamilton's younger business men" was struck by a car, and becomes acquainted with the hospital. Happily John had an inquiring mind, and all staff members who served him were on the job of informing the patient. Other cities might well use the idea.

An editorial and a cartoon in the same newspaper resulted from a recent news release. The news release was based on material in a current issue of *Health News*, New York State Dept. of Health. The subject was the decreased maternal death rate in the face of an increased birth rate. The cartoonist and the editorial writer served the *Albany Evening News*.

To understand that marvelous medium, the newspaper, which plays so large a part in adult health education, one needs to visit a newspaper plant. An illuminating supplement to an actual visit to any newspaper is "News: The Story of How It Is Gathered and Printed," issued by the *New York Times*, West 43d St., New York, N. Y. By picture and text this pamphlet will make clear much that is not obvious in the personal visit to a newspaper office. *Free.*

WHAT OTHERS HAVE DONE

The holiday spirit, Christmas, and New Years were utilized by bulletins, news releases, and special cards from various departments and associations.

Several state-wide Home Hygiene Days were sponsored in recent months by the American Red Cross. *The Red Cross Courier* suggested that store window demonstrations be featured.

"Scientific Eating Campaign at Stephens College," by T. Rose. *Journal of Home Economics*, 101 E. 20th St., Baltimore, Md. Nov., 1934. *30 cents.* Plan for "Scientific Eating Week" in a college.

"Cancer Prevention Week in Quebec," by Dr. E. Couillard. *Canadian Public Health Journal*, 105 Bond St., Toronto 2, Ontario. Sept., 1934. *35 cents.*

In the exhibition the technic of microscopic examination of tissues was suitably demonstrated in the following manner. The visitor, after being shown a microscope, was directed by an arrow to three excellent displays of micro-photographs, in natural colors, of cancerous lesions, including lesions of the central nervous system, various organs, the bones and skin. These micro-photographs, on glass, were illuminated, permitting of examination as transparencies. . . . Gross pathological specimens of cancer were exhibited in the center of the room, showing lesions of all the organs of the body. Special attention was paid to the arrangement of this portion of the exhibit, so that lay persons might better understand the nature of cancer. . . . The visitors were conducted through the exhibit by physicians from the university hospitals.

The widespread distribution of blotters and cards was a feature of the week. The advertising cards, whether large or small, the blotters, and the other literature presented an allegory of cancer, which was represented by the figure of a crab. In this picture the crab, in striking green or red color, casts its shadow ahead, but its forward progress is impeded by a sword, the symbol of surgery, and by a lightning-like ray, a symbol of electricity and radium. Two crabs of gigantic proportions adorned the side panels of the entrance to the hall. Constantly used in the advertising and publicity was the message, "Kill Cancer before it Kills You," conveying in a striking manner the keynote of the "Week"—the prevention of cancer deaths.

BOOKS AND REPORTS

American Medicine—*By Henry E. Sigerist, M.D. New York: W. W. Norton & Co., Inc.*, 1934. 436 pp. Price, $4.00.

There is a certain satisfaction in finding a book by a prominent author which one can safely advise one's colleagues it is not necessary to acquire. In this instance the reason is simple, and inherent in the fact that while there is some history in certain chapters, the bulk of the volume is a digest of recent, or at least contemporary, publications, quite familiar to physicians and others reasonably well read in the professional, social, educational, and preventive aspects of medical art and science. *American Medicine*, in 286 pages, was written for German consumption, and while doubtless quite appropriate for that purpose, constitutes something of a surfeit in its translated form.

One is led by the jacket to anticipate a formidable treatise: "The rise and progress of American Medicine from the earliest times to the present," and, knowing the traditional thoroughness and meticulous methodology of such masters of history as Sudhoff and Harrison, to search for nuggets of newly mined gold of real merit from their colleague and pupil, the junior historian, author of this volume.

In the introduction we are told that "four years of intensive studies" went to the product of this book, and on the last page we read, "This book kept me busy for four years," and yet we find that the author first visited this continent in September, 1931, and the text after completion in German in the winter, 1932–1933, was translated without change, other than minor corrections, by May of 1934.

We have read Dr. Sigerist's *Great Doctors* and *Man and Medicine*, and hope we may have in due time *Russian Medicine*, which he announces, but it was hardly worth while to offer to physicians in the United States quite so large an aggregation of medical abstracts in so casual a descriptive form as this *American Medicine*.

Of the 9 chapters, the first 3 on the Indians, the discovery and conquest of the Americas, on the colonial settlements and their separate and characteristic hardships, and on the United States down to date, give us a pleasant sketch, as it were, gleaned from John Fiske, George Trevelyan, and James Truslow Adams, and quite in the best manner of a good school book, and quite picturesque as a background for the "Pioneer" chapter which follows.

While regional and provincial preferences might differ, there will be general unanimity of belief that the 11 physicians picked as our profession's pioneers are well chosen, from Morgan and Rush, through McDowell, Drake, Beaumont, Gross, and Sims, to the giants of our day, Holmes, Mitchel, Billings, and Osler. This is a good chapter and shows a sincere appreciation based on wide reading and much listening. One searches in vain for references to the story of great physicians well known of in our neighbors' Dominion.

Some explanation of a quite understandable predominance of illustration from the now well-worn story of Johns Hopkins appeared necessary, even to the author, for we find on page 146, "I

shall give the greatest space to describing the set-up of Johns Hopkins University, not only because I am most familiar with it, but because I have the impression that there has been found the most successful solution." We may wonder whether always, and in the continuing product, the verdict of the future will be the same as to solution.

The gist of chapter 5 is a general reflection of the Flexner and subsequent A.M.A. Council reports. As a contemporary visitor telling his home folks what he read or heard in the United States, it is brief and to the point. In the 34 pages of chapter 6, we are led hurriedly through the Rappleye and the Committee on Costs of Medical Care reports, stopping briefly to touch on distribution of physicians, group clinics, costs, insurance, the A.M.A., and the medical arts. Similarly, in chapter 7, we skip along with short comments on hospitals, old and new, the American College of Surgeons, hospital financies, social workers and nurses, all of which take but 25 pages.

Preventive medicine in America requires 36 pages to deal with city, state, and federal health services, often ignoring important origins, dating Child Hygiene as late as 1915, and then giving a passing word to a few communicable diseases, the White House Conference on Child Health, sterilization, mental hygiene, and periodic health examinations.

The last chapter devoted to Medical Science leads to the conclusion that "The beginning of the place of the United States in Medical Science was in 1893 when at Johns Hopkins Medical School was established a scientific center of first rank, and with it a beginning of organized research."

New Yorkers must forget their Prudden, Delafield, and Park, and other cities their scholars of other years, in the face of the above authoritative opinion!

The translation of *American Medicine* for sale in this country would seem to add little to the convenience or the substance of contemporary publications.

HAVEN EMERSON

Dynamics of Population—*By Frank Lorimer and Frederick Osborn. New York: Macmillan,* 1934. 461 pp. $4.00.

Dynamics of Population is divided into four parts:

Part I, Population Trends of American Groups, covers the trend of the total population and reproduction trends by race, nativity, occupation, and economic status. The conclusions of Part I state that there is no marked difference in the net reproduction rates between whites and Negroes, whereas there seems to be high fertility in the other racial groups: Mexicans, Japanese, Chinese, and American Indians. There also seems to be a tendency to lowered fertility as "foreign" groups become "native," that is, after the second generation in this country. Once the foreign group adopts the American customs the problem of fertility becomes regional or social.

Part II, Measurable Characteristics of American Groups, deals with the variation in physical development and health of American groups, the variation of cultural-intellectual background among racial and regional groups, and groups classified by occupation and social status.

Part III, Influence of Differential Reproduction on the Characteristics of the American People, covers the social and biological influence on fertility. The conclusions on this section state that, at present, there is a negative association between fertility and cultural-intellectual level which if allowed to go on, threatens to defeat the aims of the whole public educational movement. A slight increase in the reproduction rates in the higher intelligence group and a

correspondingly slight decrease in the reproduction rate of the groups with lower than average intelligence would materially decrease the number of feebleminded and increase the number of individuals of higher intellectual capacity. At present this is just the opposite.

Part IV, The Causes and Control of Population Trends, covers the physical, medical, social and economic factors affecting fertility and a discussion on the possibilities of social control. In groups with a high standard of living and a knowledge of contraceptive methods, there must be social conditions that are very favorable to fertility to keep the group self-replacing. It was also found that higher education of women tends to delay marriage but education is not a factor in lowered fertility among married women. There is, however, a negative association between full-time gainful occupations for women and fertility.

In conclusion the authors state:

> Population trends have run their course in the past with little attention by anyone to their momentous influence on human destiny. Variations in fertility, although immediately controlled by individuals, are indirectly determined by particular social factors. It is evident that the social conditions which affect reproduction might be modified in a number of ways, so that the dynamic influences of population change would be more in line with conscious social objectives. Eventually, if our dream of human progress is to be realized, rational social action must replace the operation of blind forces in this as in other fields. In the furtherance of this ideal there is need both for more exact science and for a larger appreciation of the possibilities and values of human life.

There are a great number of charts and tables throughout the text—126 tables and 54 charts, all of which are from reliable sources. The book is well indexed and includes a glossary and complete bibliography which will be of particular interest and help to students of sociology.

E. J. CROSS

An Activity Analysis of Nursing—*By Ethel Johns and Blanche Pfefferkorn, New York: Committee on the Grading of Nursing Schools,* 1934. 214 pp. Price, $2.00.

This book reports one of the projects recommended by the Committee on the Grading of Nursing Schools to be listed on the Five-Year Program adopted in 1926. The committee felt that before nursing schools could be assisted in preparing good nurses, it needed to discover what good nursing is and how it can be taught.

The first chapter tells us what good nursing is, and is a classic. The information in it may be put to many uses. The great variety of men in all occupations invited to make commencement addresses in nursing schools can obtain here a fine background for writing their papers. Those physicians ever with us who still think nurses are receiving too much education to be useful will get an eye-opener.

The analysis which follows the first chapter is a revelation. It was time someone did a little research to find the depth to which the teaching of the fundamental sciences to nurses should be carried. In Chapter VII a possible technic is suggested which may prove useful as a practical demonstration of the direct relation to actual nursing procedure of the technic of science. For this purpose attention is concentrated on pneumonia for the disease, and anatomy and physiology for the subject taught.

One becomes a little more thoughtful about nursing as he reads the list of 12 nursing aspects which were selected for classification as they relate to conditions requiring nursing care in the hospital and community.

Although this book is most valuable to those interested in teaching and making the curriculum for nursing schools, there is meat in it for all in any way concerned with good nursing.

The book is written in a scholarly manner and is a really scientific book, in our opinion. EVA F. MACDOUGALL

The Adolescent in the Family: A Study of Personality Development in the Home Environment—*Publication of the White House Conference on Child Health and Protection. New York: Appleton-Century,* 1934. 470 pp. Price, $3.00.

This volume presents the report of the Subcommittee on the Function of Home Activities in the Education of the Child, of the White House Conference on Child Health and Protection. Its format and method of presentation is similar to other publications appearing in this series.

A serious attempt is made "to obtain a picture of the present-day American family functioning as an environment for child development." The study was based upon carefully prepared questionnaires obtained from 13,000 public school children of junior high school age, about 8,000 of whom were selected for detailed study. Several hundred teachers contributed to the study by filling out a rating scale for each pupil.

Part I compares white American, Negro, and immigrant children from the standpoint of rural and village life. Such factors as socio-economic status, the broken home, social isolation, religious training, confidential relations between parents and children, etc., are considered in the light of the data obtained.

Part II considers the personality of the child and the family background, taking up the status of the family, family activities, health regulations, sex education, types of successful and unsuccessful families, and parent-child relations, and family education.

The appendix is replete with detailed comparative tables, a thorough discussion of the methods used in the study, and copies of the questionnaires. One of the most valuable parts of the book is the number of case histories scattered throughout the text to illustrate various phases of the subject.

Two the findings stand out clearly and may be mentioned here:

> The externals of home life, like its economic status or its housing arrangements, while important, are not nearly so significant for personality development of the child as are the subtler and more intangible aspects of family life, such as affectionate behavior, relations of confidence, inculcation of regularity in health habits and reactions to the illness or nervousness of parents. . . .
>
> The average level of family relations and of personality adjustment of the children is somewhat higher for urban than for rural children. . . . If it stands the test of further inquiry, it indicates the validity of the assertion that the loss of certain economic and other functions from the home makes possible the more harmonious organization of family life upon a cultural and affectional basis. It may also show the result of the greater effect of child study and child care movements in the city than in the country.

One cannot read this volume thoughtfully without being impressed with the profound changes which have come over the American home in one generation. Many of our present-day socio-economic problems are closely lined with adolescent-child-family relationships and an intimate knowledge of these should help us in making the new adjustments necessary. RICHARD A. BOLT

The Advance of Science—*Edited by Watson Davis. New York: Doubleday, Doran,* 1934. 400 pp. Price, $3.50.

It would indeed be a bold man who attempted a critical review of this book. It covers subjects ranging from the cosmic ray and the smashing of the atom to evolution, race betterment, and human behavior. There may be individuals who are competent to speak knowingly on all of the subjects treated, but the reviewer is not. The editor, who is in constant touch with all the leading sources of scientific knowledge

in this country as well as Europe, has called to his assistance upward of 60 specialists to whom he has given credit for coöperation and advice. The names are a guarantee of the accuracy of the statements made.

Even those who keep in touch with the advancement in science will be astonished at what has been collected within the 390 pages of text. It is well written in an interesting manner, and is therefore easy to read, even though some of the subjects discussed are very abstruse. There are useful tables giving the glands and their hormones, the vitamins as far as known, and other subjects which are being mentioned more and more frequently in the daily press.

The book is abundantly illustrated, though some of the illustrations appear to the reviewer to be misplaced. For example, it is hard to see why the photographs of lightning, electric sparks, spectrum of a meteor, or a mercury boiler drum should be put under the head of The Fight Against Disease. We judge that this is economic, as space on these same pages is given to the new giant X-ray tube and the picture of Johnny who roller-skated just after his first birthday.

There is a glossary of new words in science, some of which do not seem to be new enough to find a place in this book. A table of Atomic Weights, the Metric System and its conversion into the English system, comparison of the thermometer scales, and diagrams of the Heavens in several seasons of the year are given. The book is a mine of information and should be welcomed in every library and by all readers. The volume ends with a good index which assists greatly in its use.

We can only add that it is with a good deal of pride we note what has been done in America. It is not too much to say that American scientists are now the equals of those in any part of the world. We back this statement by calling attention to the Americans who have won the Nobel prize in the last few years. MAZŸCK P. RAVENEL

Human Nature. A Guide to Its Understanding—*By Judson Rea Butler. New York: Greenberg.* 174 pp. Price, $2.00.

This book aims to be a guide to the understanding of human nature. It is written in a style which is interesting, and numerous examples facilitate understanding by the layman. Varied topics are included in an extensive discussion of the partial identity principle, by which "Any part of a situation which causes a definite act may later call forth the same response, either in whole or in part." Subjects range from child training to mental hygiene, from habit-control to hypnosis. IRA V. HISCOCK

Medical Diseases for Nurses—*By Arthur A. Stevens, M.D. and Florence Anna Ambler, R.N. (2d ed.) Philadelphia: Saunders,* 1934. 513 pp. Price, $2.75.

This book has the earmarks of a successful text. It represents the joint thinking of a physician and a nurse. It is written simply and directly, without any superfluous words and with excellently marked headings. The lack of illustrations does not seem to detract from its value.

Pneumonia which according to *An Activity Analysis of Nursing* seems to be one of the most frequent diseases to need nursing care both in hospitals and in the community, is given a great deal of attention.

As in the old edition, each disease is treated under the following captions: definition, etiology, symptoms, pathology, complications, prognosis and treatment. There is not an omission anywhere, and all details are treated clearly.

Our only criticism is of a paragraph

dealing with the nursing care of tuberculosis which says "During the night all windows should be wide open no matter how cold it is or how stormy." We feel that in the best tuberculosis hospitals today there is not nearly as much emphasis on cold air. Some of the newer tuberculosis hospitals are even being built several stories high, with hardly any balconies—the buildings resembling hotels.

It seems that with so much emphasis as is being put on prevention, a paragraph on how to prevent each particular disease might be inserted. This is covered somewhat under Etiology, but on the negative side.

We recommend this book and shall keep it close by to draw on both in our professional relationships and in those personal ones in the home and among our friends. EVA F. MAC DOUGALL

Rules for **Recovery from Tuberculosis**—*By Lawrason Brown, M.D. Philadelphia: Lea & Febiger,* 1934. 275 pp. Price, $1.75.

In the treatment of tuberculosis the good doctor teaches the patient to help himself. Dr. Brown's book, designed specifically for the tuberculous patient, was perhaps the earliest of its kind. It grew out of his practice of conducting a "question box" hour for the patients at Saranac Lake. For years it has been a best seller. Patients by the thousands have read and re-read it and kept it for reference. Its kindly, cheerful tone and a certain charm of style have won for it the designation of the tuberculosis patient's bible. The 6th edition is a complete revision, which adds about 30 pages. Special attention is given to collapse therapy, after-care, and social readjustment of the patient. The vaccination of children to prevent tuberculosis, a discussion of special diets so much written about lately, the use of alcohol and tobacco, also receive emphasis.

The book is compact in size, printed in large type and has a bibliography and a good index. H. E. KLEINSCHMIDT

The Art and Principles of Nursing—*By Amy Elizabeth Pope, R.N., and Virna M. Young, R.N. New York: Putnam,* 1934. 832 pp. Price, $2.75.

Section I, 662 pages, of this text deals specifically and definitely with the technic of professional nursing. In addition to the topics usually discussed in texts in this field, it has a chapter on Hydrotherapy and Heliotherapy, and one on the various tests so much used in modern medicine as a means of diagnosis.

The discussions and descriptions of technics are done carefully and concisely. They contain not only directions as to the technic itself, but as to the equipment needed, the reasons for precise procedures, and the precautions to be taken in special types of cases.

Section II is devoted to a discussion of diseases, types, causes, and special nursing care.

This text is evidently based on experience, is interestingly written, and concise. It is well worth the careful study of nurses, and, since it indicates the standard nursing procedure in various diseases, might well be read by physicians. CHARLES H. KEENE

A SELECTED PUBLIC HEALTH BIBLIOGRAPHY WITH ANNOTATIONS

RAYMOND S. PATTERSON, PH.D.

Practical Prenatal Hygiene—Nine methods of approach the public health nurse may use in maternity case-finding.

ANON. Maternity Case-Finding. Health News, New York State Department of Health 11, 49:194 (Dec. 3), 1934.

The Doctor and the Public Health Nurse—Reiteration of the fact that organized medicine does not know the public health nurse and why. Yet the relationship between the medical and nursing professions is recognized by leaders in both groups as the most important factor governing the success or failure of a public health nursing program.

BLUMENTHAL, R. W. Organized Medicine and the Public Health Nurse. State Board of Health Bulletin, State of Wisconsin, 5, 20:3 (Dec.), 1934.

Vitamin Milks—Milk fortified with vitamin D is a valuable way of administering the needed vitamin to infants, to expectant, and possibly to nursing, mothers. That it is of value to normal adults or that it may have undesirable after-affects, only time will tell.

BUNKER, J. W. M. and HARRIS, R. J. The Clinical Status of Vitamin D Milks. New Eng. J. Med. 211, 25:1140 (Dec. 20), 1934.

For the Better Diagnosis of Syphilis—A scheme, by which blood samples will be sent to serologists who have developed diagnostic tests for syphilis, has been undertaken to appraise the various modifications of complement fixation methods and flocculation tests.

CUMMINGS, H. S. *et al.* The Evaluation of Serodiagnostic Tests for Syphilis in the United States. J.A.M.A. 103, 22:1705 (Dec. 1), 1934.

About the Phage—In this review of the bacteriophage phenomenon, while dealing largely with therapy, the value of which the authors seem to doubt, the bacteriologic and immunologic parts of the discussion will be of interest to sanitarians.

EATON, M. D. and BAYNE-JONES, S. Bacteriophage Therapy. J.A.M.A. 103, 23: 1769 (Dec. 8), 1934.

Milk Safeguards—Facts that the public should know about milk (with which every sanitarian must be familiar) include, of course, the discussion of an adequate milk control ordinance. Consumers are stimulated to see that theirs equals the U.S.P.H.S. Standard and that it is enforced.

FRANK, L. C. What Every Person Should Know About Milk. Pub. Health Rep. 49, 50:1505 (Dec. 14), 1934.

Evidence of Brucella Infection—In those departments of packing plants in which cows are slaughtered, as high as 80 per cent positive reactions for brucella infection were found among the workers, although no histories of frank undulant fever could be elicited. Some cases did occur among those working with hogs. The incidence of the allergic state varied with the length of employment.

HEATHMAN, L. S. A Survey of Workers in Packing Plants for Evidence of Brucella Infection. J. Infect. Dis. 55, 3:243 (Nov.-Dec.), 1934.

Bed Rock Public Hygiene—The essentials of adequate public health administration, so familiar to sanitarians, are set forth briefly and convincingly.

HISCOCK, I. What Is an Adequate Health Program? New Eng. J. Med. 211, 25:1153 (Dec. 20), 1934.

Food-Borne Streptococcic Poisoning—Green-producing streptococci isolated from an offending cream pie yielded a filtrate causing typical symptoms of food poisoning when fed to monkeys. Green-producing streptococci from other sources like infected teeth and feces likewise produced toxic filtrates.

JORDAN, E. O. and BURROWS, W. Streptococcus Food Poisoning. J. Infect. Dis. 55, 3:363 (Nov.–Dec.), 1934.

Breast Milk Distribution—How breast milk is collected and dispensed to babies needing it in New England is told in the first of two papers. How the supply and demand is controlled and met will be told in a succeeding paper.

KEENE, H. M. Maternal Milk Collection. Pub. Health Nurs. 26, 12:649 (Dec.), 1934.

Rheumatic Fever in Children—Children's hearts are especially susceptible to rheumatic infection, and heart disease in patients under 20 is rheumatic in origin. Treatment can prevent permanent damage.

LYON, J. A. Rheumatic Heart Disease in Early Childhood. New Eng. J. Med. 211, 26:1185 (Dec. 27), 1934.

"They Shall Not Starve"—Another paper indicating that average weights of children in 1934 do not differ significantly from pre-depression averages. Evidently, in the district surveyed, the children of the poor were fed enough at least to grow at the usual rates.

PALMER, C. E. Further Studies on Growth and the Economic Depression. Pub. Health Rep. 49, 49:1453 (Dec. 7), 1934.

Perhaps You May Know all about This—Of no immediate importance to sanitarians, but still most interesting is this observation: some red blood cells have hair-like processes which exhibit a rapid whip-like motion. They may be retracted back into the cell or they may be broken off to continue their motion for a while after being detached. Later they may take on a beaded or granular appearance. The method of staining to show this phenomenon is described.

OLIVER, W. W. Staining of the Processes (Flagella) of Human Erythrocytes. J. Infect. Dis. 55, 3:266 (Nov.–Dec.), 1934.

Buying Medical Services—A whole issue of the *Survey Graphic* is given over to discussions of social medicine by an economist, a publicity man, physician, surgeon, dentist, nurse, hospital superintendent, a sanitarian, and others. An inclusive collection of essays useful to proponents of group payment for medical services.

ROSS, M. The Issue of Health. Survey Graphic 23, 12:581 (Dec.), 1934.

Colds vs. Vitamins—Vitamin A, the so-called "anti-infective" vitamin, has no effect upon the incidence or severity of colds. This bit of research will hardly dampen the enthusiasm of the advertisers, however. It is doubtful if anything will.

SHIBLEY, G. S. and SPIES, T. D. The Effect of Vitamin A on the Common Cold. J.A.M.A. 103, 26:2021 (Dec. 29), 1934.

Whither Mankind — Reviewing population trends and possibilities in the United States and other countries, the author shows that the population saturation point is placed too low and that the tropics are the goal of the white. He concludes that perhaps "the meek will inherit the earth" after all.

SMITH, W. D. World Population. Sci. Month. 40, 1:33 (Jan.), 1935.

Guiding Their Food Selection—School nurses who are asked to assist teachers and school administrators in suggesting better ways to manage school

lunch rooms can get some very practical points from this article.

SPALDING, M. School Lunch Survey. The Commonwealth, Mass. Department of Pub. Health 21, 3:156 (July, Aug., Sept.), 1934.

Cohesion in Nursing Education—How the State Nurses' Association, the State Board of Nurse Examiners, the State Medical Association, the State Department of Health, and the State Tuberculosis Association did some brain work in helping to prepare over 150 unemployment relief nurses to do public health work.

TEAL, H. Indiana's E.R.A. Nursing Institutes. Am. J. Nurs. 34, 12:1158 (Dec.), 1934.

Smallpox Diagnosis and Immunity—This detailed discussion of the whole field of "pock diseases," 60 pages long, introduces a vaccinia-variola flocculation test both specific and delicate; an anteserum is described with which passive immunity may be provoked and which may be of value in sensitizing living vaccinia.

TULLOCH, W. J. The Serological Diagnosis of Smallpox and the Laboratory Investigation of Vaccinia. J. State Med. 42, 12:683 (Dec.), 1934.

Cancer Control Deficiencies—Surveying the cancer experience of a hospital in a large city, the author recommends more educational campaigns, better diagnosis, and the establishment of a division of cancer control in the State Department of Health.

WILD, W. F. A Survey of Cancer Cases in the Hospitals of Bridgeport, Conn., 1928–1932 Inclusive. Am. J. Cancer 22, 4:878 (Dec.), 1934.

Experiments in Encephalitis—Serum studies are reported that show the St. Louis type encephalitis is distinct from other forms of encephalitis and poliomyelitis.

WOOLEY, J. G. and ARMSTRONG, C. The Distribution of Immunity Against Encephalitis Virus of the St. Louis Type in the United States as Determined by the Serum Protection Test in Mice. Pub. Health Rep. 49, 50:1495 (Dec. 14), 1934.

BOOKS RECEIVED

DR. BUNDESEN'S DIET BOOK. The Safe Way to Reduce. By Herman N. Bundesen. Chicago: Reilly & Lee, 1934. 158 pp. Price, $1.50.

MEDICAL TACTICS AND LOGISTICS. By Colonel Gustavus M. Blech and Colonel Charles Lynch. Springfield, Ill.: Thomas, 1934. 205 pp. Price, $4.00.

ABORTION. By Dr. William J. Robinson. Hoboken: American Biological Society, 1934. 123 pp. Price, $2.00.

SKIN DEEP. THE TRUTH ABOUT BEAUTY AIDS SAFE AND HARMFUL. By M. C. Phillips. New York: Vanguard, 1934. 254 pp. Price, $2.00.

ENCYCLOPEDIA OF SEXUAL KNOWLEDGE. Norman Haire, Editor. New York: Coward McCann, 1934. 636 pp. Price, $6.00.

TEXT-BOOK OF MEAT INSPECTION. (Ante-Mortem and Post-Mortem). By Robert V. Ostertag. Chicago: Alex. Eger, 1934. 744 pp. Price, $10.00.

ASSOCIATION NEWS

DR. REGINALD M. ATWATER APPOINTED EXECUTIVE SECRETARY

DR. EUGENE L. BISHOP, President of the American Public Health Association, announces the appointment of Reginald M. Atwater, M.D., Dr.P.H., as Executive Secretary of the Association. Dr. Atwater for the past 8 years has been Commissioner of Health in Cattaraugus County, N. Y., which was the first of the counties in New York State to organize on a full-time county unit basis for health.

Dr. Atwater, who is a native of Colorado, is a graduate of Colorado College and of the Harvard Medical School where he received his M.D. degree in 1918. He became a Rockefeller Foundation Fellow in Public Health and was granted the degree of Dr.P.H. by Johns Hopkins in 1921. Going to the Orient Dr. Atwater became Associate Professor of Hygiene in the Hunan-Yale College of Medicine in Changsha, China, from which post he returned to the United States in 1925 to teach in the Harvard School of Public Health.

Since 1927 Dr. Atwater has occupied his present position in Cattaraugus County where he has been in charge during the period of transition from the health demonstration to the official department of health. During his administration several active research projects have been carried out in Cattaraugus County through the coöperation of the Milbank Memorial Fund, the U. S. Public Health Service, and other agencies. Studies of tuberculosis prevention and control, studies of rural water supplies, of rural health administration, and of general morbidity have been published from the Department.

Reginald M. Atwater, M.D., Dr.P.H.

The new Executive Secretary is a member of his county and the New York State Medical Societies, a Fellow of the American Medical Association, and a Fellow of the A.P.H.A. He is the author of several studies in epidemiology published in professional journals and he comes to the Association with a background of full academic training and practical experience in public health.

MISSING

GEORGE H. BIGELOW, M.D., F.A.P.H.A., formerly Commissioner of Public Health of the Commonwealth of Massachusetts, and present Director of the Massachusetts General Hospital, Boston, Mass., is missing. He may be a victim of amnesia.

Members of the Association desire that the Journal publish the following description of Dr. Bigelow.

Description: 6 ft. tall; weighs approximately 175 lbs.; has deep blue eyes; heavy shock of black hair closely cut, slightly gray at the temples. He is of rangy build. When he left his home he wore a soft brown felt hat, a black overcoat with a velvet collar, a brown suit, and tan rubber-soled shoes, and a soft white shirt. He is 44 yrs. of age. He wore a square silver wrist watch with a leather strap, and carried a brown pigskin brief case.

He disappeared December 3, 1934, having left his home in Milton, Mass., for his office in the Moseley Building at the Massachusetts General Hospital, Boston, Mass. He was to appear at 8 P.M., Tuesday night, December 4, 1934, at the Staten Island Hospital to speak, and on Wednesday at the American Society for the Control of Cancer in New York City.

The finger prints of Dr. George H. Bigelow are in the possession of the Department of Public Safety of the Commonwealth of Massachusetts. Hospitals are requested to finger print all amnesia victims unidentified,

George H. Bigelow, M.D.

forwarding the same to Colonel Paul G. Kirk, Commissioner of Public Safety, State House, Boston, Mass.

HEALTH CONSERVATION CONTESTS FREE SURVEYS

THE American Public Health Association, in coöperation with the Chamber of Commerce of the United States, has recently announced the offer of two free public health surveys, one to a city in connection with the City Health Conservation Contest and the other to a county or district in connection with the Rural Health Conservation Contest.

The survey will consist of a careful analysis of the city's or district's public health program, its facilities and the extent to which these facilities are meeting local public health needs, and will include a report of the appraisal thus made together with recommendations for such readjustments or changes as would seem most likely to bring about a more effective program.

The survey will be made by the field staff of the Association. Any city entered in the City Contest or any district entered in the Rural Contest (except those receiving First Award) is eligible to apply for the free survey.

If a city or district desires to be considered, the approval of the health officer should first be secured by the Public Health Committee of the local Chamber of Commerce. A formal request should then be submitted to the

Insurance Department of the Chamber of Commerce of the United States or to the American Public Health Association. Such a request may precede or accompany the fact-finding schedule. However, for cities, this application must be submitted not later than March 1, and for counties not later than March 15. At least three cogent reasons stating why the public health committee feels its city or district would benefit by such a survey *must* accompany the request.

These two free surveys will be granted not upon the scores obtained in the 1934 competitions but upon the following main factors:

1. The need of the community for a health survey
2. The opportunity and likelihood of the community making effective use of such a survey

For further information write either the Insurance Department, Chamber of Commerce of the United States, Washington, D. C., or the Committee on Administrative Practice, American Public Health Association, New York, N. Y.

APPLICANTS FOR MEMBERSHIP

The following individuals have applied for membership in the Association. They have requested affiliation with the sections indicated.

Health Officers Section

Laura A. Arney, 2650 N. 74 Court, Elmwood Park, Ill., Health Officer

Frank M. Carroll, M.D., 300 Public Safety Bldg., Seattle, Wash., Commissioner of Health

W. H. Cleveland, M.D., Tupelo, Miss., Director, Lee County Health Department

Leslie A. Lambert, M.D., C.P.H., Court House, Flint, Mich., Genesee County Commissioner of Health

Marion F. Loew, 32 Kenmore Place, Brooklyn, N. Y., Acting Supervisor, Tuberculosis Clinics, New York City Dept. of Health

Harley J. Powell, M.D., Court House, Bowling Green, Ohio, Wood County Health Commissioner

Stephen G. Wilson, M.D., Health Dept., Clinton, N. C., Health Officer

Laboratory Section

Robert S. Cosgrove, Coöperative Clinical Laboratory, Indio, Calif., Laboratory Technician

Wallace B. McClure, M.D., D.P.H., 28 Maryland Blvd., Toronto, Ont., Canada, Bacteriologist, Provincial Dept. of Health

Public Health Engineering Section

Lorenz E. Ordelheide, B.S., Sikeston, Mo., Assistant State Director, Malaria Control, U. S. Public Health Service.

Prof. Harry G. Payrow, B.S., Lehigh University, Bethlehem, Pa., Assistant Professor of Sanitary Engineering

Industrial Hygiene Section

Henry F. Smyth, Jr., Ph.D., Laboratory of Hygiene, Univ. of Penna., Philadelphia, Pa., Instructor in Sanitary Chemistry

Food and Nutrition Section

Helen S. Mitchell, Ph.D., Massachusetts State College, Amherst, Mass., Research Professor of Nutrition, Home Economics Division

Carl S. Pederson, Ph.D., New York Agricultural Experimental Station, Geneva, N. Y., Chief in Research and Bacteriology

Christian P. Segard, M.D., 2740 Graybar Bldg., New York, N. Y., Wisconsin Alumni Research Foundation

Child Hygiene Section

James T. Kenney, D.D.S., State Board of Health, Jefferson City, Mo., Supervisor of Public Health Dentistry.

Public Health Education Section

Gretta M. Adams, M.S., 615 Belle Ave., San Rafael, Calif., Professor of Hygiene, Dominican College

Ramona Borree, 532 Fourth St., Haywood, Calif., Public Health and School Nursing, Alameda County Health Dept.

Mary C. Bushard, 422 Main St., Hayward, Calif., Teacher of Home Hygiene and Public Health

Eloise A. Hafford, 735 N. Los Robles, Pasadena, Calif., Director, Health Education, Ruth Home, El Monte, Calif.

Walter O. Kraeft, M.S., 1107 Monroe Ave.,

River Forest, Ill., Teacher of Public Health, Concordia Teachers College

Epidemiology Section

Ragnar T. Westman, M.D., 401 City Hall, Minneapolis, Minn., Chief Epidemiologist, Department of Health

Public Health Nursing Section

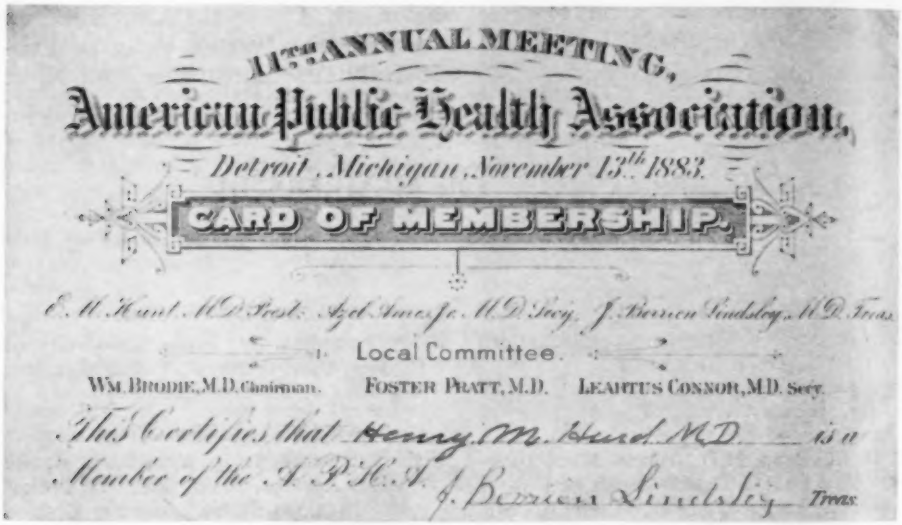
A. Elizabeth Bigelow, 577 E. Main St., Meriden, Conn., Director of Public Health Nursing Association

Jessie S. Diel, Ripley, W. Va., Public Health Nurse

Neva R. Hackworth, R.N., Perryville, Ark., School Nurse

Unaffiliated

Henry Packer, M.D., 356 Oak St., New Haven, Conn., Candidate for Dr.P.H., at Yale Univ.


11TH ANNUAL MEETING,
American Public Health Association,
Detroit, Michigan, November 13th 1883.
CARD OF MEMBERSHIP.
E. M. Hunt, M.D. Prest. Sgd. Ames Jr. M.D. Secy. J. Berrien Lindsley, M.D. Treas.
Local Committee.
WM. BRODIE, M.D. Chairman. FOSTER PRATT, M.D. LEARTUS CONNOR, M.D. Secy.
This Certifies that Henry M. Hurd M.D. is a Member of the A. P. H. A.
J. Berrien Lindsley Treas.

John E. Ransom, Assistant Director of The Johns Hopkins Hospital, Baltimore, Md., very kindly sent to the Association an old membership card dated November 13, 1883. For the interest of the members, we are reproducing it above.

NEWS FROM THE FIELD

HEALTH EDUCATION SCHOLARSHIP AVAILABLE

A FULL tuition scholarship of $500 is available in the field of health education at the Massachusetts Institute of Technology (Department of Biology and Public Health), Cambridge, Mass., for 1935–36. This scholarship covers the full scholastic year, beginning in September and closing in June. It is available for women only.

This scholarship will be awarded to a candidate recommended by the National Tuberculosis Association. Applicants should have basic training in mathematics, physics, chemistry, and biology. Undergraduate training in psychology and education is desirable. The awards will be based upon the nature and quality of the previous academic work of the applicant, personality qualifications for professional work in the field of public health, and need of scholarship aid. Preference will be given to candidates possessing the Bachelor's degree and having had successful teaching or administrative experience.

DU PONT OPENS NEW RESEARCH LABORATORY

E. I. DU PONT de Nemours & Company dedicated and opened on January 22 its new medical research laboratory, to be known as the Haskell Laboratory of Industrial Toxicology, the purpose of which will be to test thoroughly, from a health standpoint, all products produced by the Company before they are placed on the market.

The laboratory was planned to meet a need which has developed in this country because of the great growth of the chemical industry as represented by du Pont. Many new products have been developed in recent years and other new products are constantly being developed, some of them through entirely new processes. A function of the laboratory will also be to study the possible effects of the new products upon the health of employees during the process of manufacture.

NEW OFFICERS ELECTED AT GENEVA MEETING

AT the meeting of the International Congress on Public Health Works held recently in Geneva, the following officers were elected:

President, M. Justin Godart

Vice-Presidents, H. E. G. DeMichelis, Sir George Buchanan, C.B., M.D., and H. E. Alfredo de Castro.

Secretary General, M. Raymond Mage.

MENTAL CLINIC FOR CHILDREN

THROUGH an endowment from the Friedsam Foundation, a new Division of Child Neurology has been created by the Neurological Institute of New York.

Dr. Bernard Sachs will be the Director of the new division, and Dr. Frederick Tilney, Director of Research of the Institute, will be Associate Director and in charge of research work. Dr. Louis Casamajor will serve as an Associate Director.

AMERICAN STUDENT HEALTH ASSOCIATION ELECTS NEW OFFICERS

AT the last annual meeting in New York City, Dr. R. W. Bradshaw, College Physician, of Oberlin College, was reëlected President of the American

Student Health Association. Dr. Wade McMillan, of Miami University, was elected Vice-President, and Dr. Harold S. Diehl, member A.P.H.A., of the University of Minnesota, was elected Secretary-Treasurer.

DEATHS

HARRY F. FERGUSON, member A.P.H.A., Chief Engineer, Division of Sanitary Engineering, State Department of Public Health, Springfield, Ill., died January 16.

DR. LEWIS STEPHEN PILCHER, Editor for half a century of the *Annals of Surgery*, died December 24, 1934, at the age of 89.

PERSONALS

DR. WALTER HENRY HARTUNG, of Toledo, was appointed Director of Health of Ohio on November 28 by Governor-Elect Martin L. Davey. He is a member of the staff of St. Vincent's Hospital, Toledo.

DWIGHT S. ANDERSON, member A.P.H.A., of Woodside, N. Y., has been announced as the new Director of the Public Relations Bureau of the Medical Society of the State of New York, with offices at 2 East 103rd Street, New York.

DAVID H. MCALPINE was reëlected President of the United Hospital Fund at the annual meeting of the corporation held in New York recently.

MAURICE BRODIE, M.D., member A.P.H.A., of New York, and WILLIAM H. PARK, M.D., F.A.P.H.A., of New York, were named among others as having made great contributions to medical science during 1934, as announced in *Modern Medicine*. Dr. Brodie was honored especially for his work in developing a vaccine for infantile paralysis; and Dr. Park for his development of an infantile paralysis vaccine and for his work in preventive medicine.

CONFERENCES

Mar. 27–29, Canadian Section, American Water Works Association, London, Ont., Canada.

March 31–April 7, National Negro Health Week—21st Annual Observance.

April 10–11, Montana Section of American Water Works Association, Helena, Mont.

April 11–12, Four States Section Meeting of American Water Works Association, Atlantic City, N. J.

April 24–27, National Convention, American Physical Education and its Eastern District Society, Pittsburgh, Pa.

April 29–May 3, 19th Annual Clinical Session of the American College of Physicians, Philadelphia, Pa.

May 6–10, Annual Convention of American Water Works Association, Cincinnati, Ohio.

May 24–25, Spring Meeting of New York State Sewage Works Association, Poughkeepsie, N. Y.

June 4–9, Annual Meeting, Royal Institute of Health, Harrogate, England.

June 17–19, Ninth Annual Iowa Conference on Child Development and Parent Education, Iowa City, Iowa.

June 19–22, Eighth Health Education Conference of the American Child Health Association, Iowa City, Iowa.

June 24–29, Summer Meeting of the American Association for the Advancement of Science and Associated Societies, Minneapolis, Minn.

July 15–20, Royal Sanitary Institute Health Congress, Bournemouth, England.

July 22–27, Seventh International Congress on Industrial Accidents and Diseases, Brussels, Belgium.

July 23–27, International Congress on Life Assurance Medicine, London.

Aug. 10–17, Meeting of Health Section of the World Federation of Education Associations, Oxford, England.